7 G2 AND G2 PIPE TUNNELS CURRENT CONDITIONS

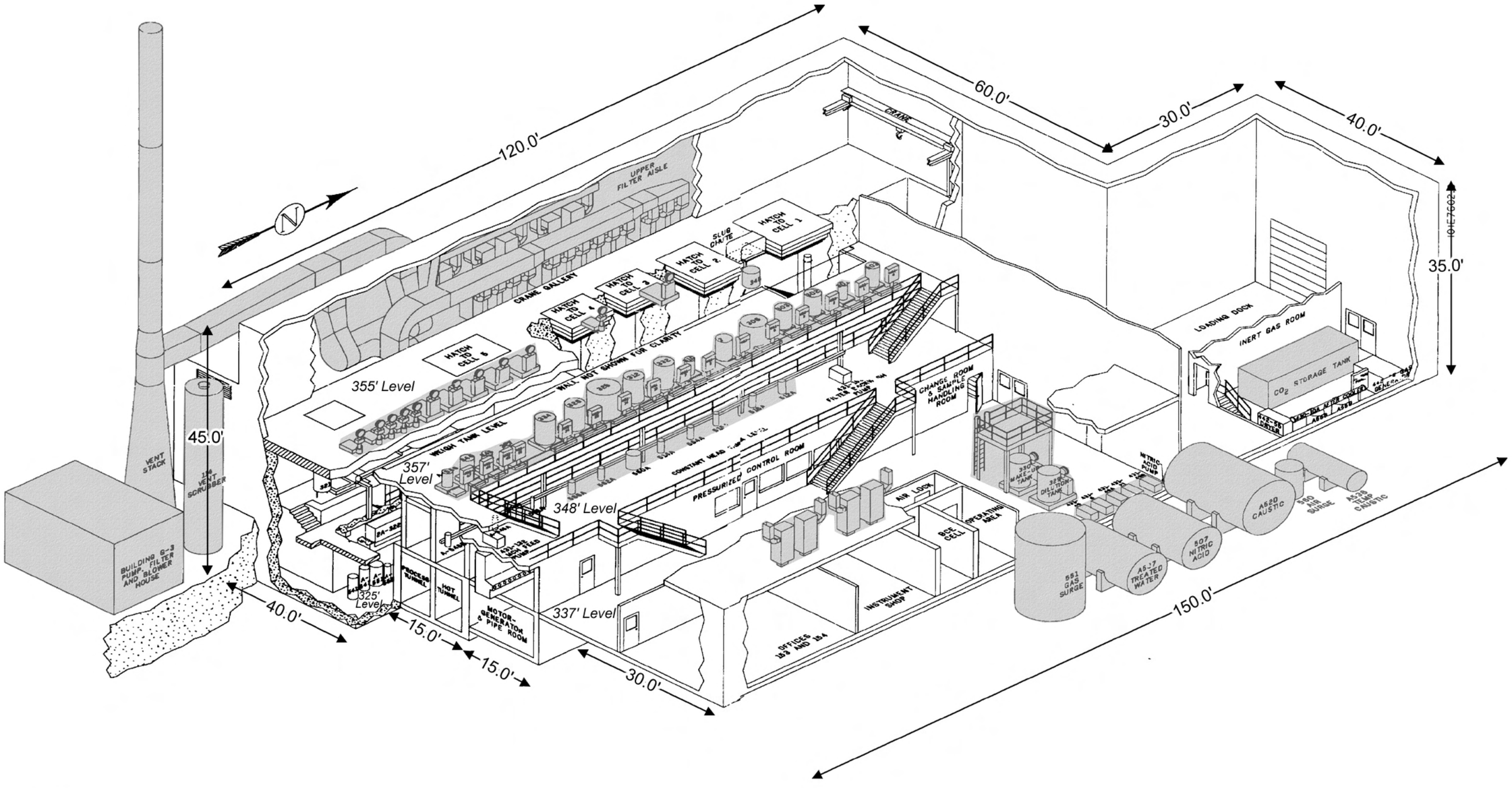
The SPRU pilot plant, Building G2, was used for research and development between 1950 and 1953. REDOX chemical processes for separating plutonium and uranium from slugs were performed until the end of 1950 and PUREX tests until mid-1953, when the technique was successfully exported for use at Hanford and the Savannah River Site (R-000255). The SPRU facilities inside G2 were decommissioned in 1953.

The following sections describe Building G2 current interior conditions by level and room, exterior areas (including Building G3), and findings. Figures 7-1, 7-2, and 7-3 show Building G2 in 2004. Figure 7-4 shows an isometric view of the Building G2. Figures 7-5, 7-6, 7-7, and 7-8 show G2 under construction in 1948 and 1949.

Figure 7-1. Photo G2-100, G2 East Side (Looking Southwest), June 2004

Figure 7-2. Photo G2-53, G2 North Side (Looking Southeast), November 2004

Figure 7-3. Photo G2-54, G2 South and West Sides (Looking North), November 2004



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Note: Representation of building interior is not to scale.

Figure 7-4. G2 Support Area Isometric Drawing, Approximate Current Conditions, November 2004

(Source – R-001949)

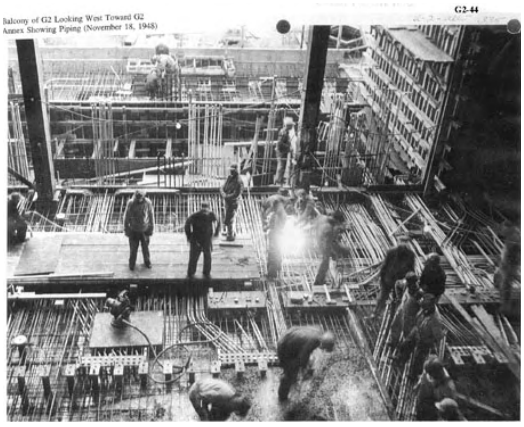


Figure 7-5. Photo G2-44, Balcony of G2 Looking West Toward G2 Annex Showing Piping, November 18, 1948

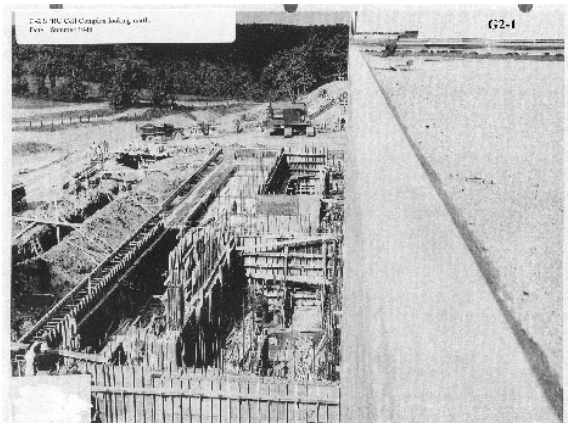


Figure 7-6. Photo G2-1, G2 Under Construction Showing Interior Wall Construction, Summer 1948

Figure 7-7. Photo G2-19, G2 Under Construction Shows Steel Framing and Concrete Walls, July 20, 1948

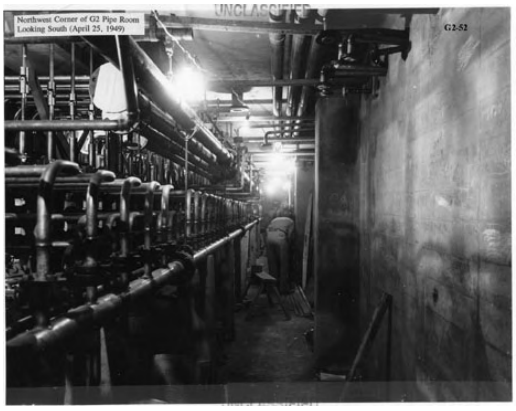


Figure 7-8. Photo G2-52, Northwest Corner of G2 Pipe Room Looking South, April 25, 1949

Building G2 is entered through north side doors or Building G1. The structure is 150 feet long (north-south), 100 feet wide (east-west), 35 feet high at the northeast corner, and 45 feet high at the southwest corner.[1] It has four levels at 325 and 327 feet,[2] 337 feet, 348 feet, and 357 feet. Floor area estimates range from 22,000 square feet (R-001949, p. 64) to 30,000 square feet (R-000255, p. 5). G2 is a steel-framed transite sided building containing heavily shielded concrete cells (R-001949, p. 64; C-000014, p. 3). Building G2 abuts the north end of Building G1. Access between the two buildings occurs at each level, but ventilation and electrical systems and plumbing are separate. Building G2 east, west, and north walls do not adjoin other buildings.

Illustrations, descriptions, and contamination estimates are based on available surveys, photos, and visual inspections and are not a guarantee of accuracy.

[1] All dimensions are approximate.
[2] Buildings G2 and H2 floors are described as feet above sea level.

G2 Floors and Ceilings

G2 floors are concrete; many are tiled. The basement floor is below grade, on a reinforced concrete slab, ranging between 1 and 2 feet thick. No equipment or process lines penetrate to the subsoil (R-001949, p. 76). Conductive floors exist in areas where they were needed to prevent ignition by static sparking (C-000014, p. 4). In Office 154, lead shielding currently covers approximately 25 feet by 25 feet of floor area.

The floors of the Pump Room and cells are recessed below the access aisle floor levels and completely lined with stainless steel to slightly above the aisle floor level. Floors of cells containing vessels are stainless steel plated, curbed to provide sufficient capacity to contain the contents of vessels that might have leaked or ruptured (C-000014). Cell rooms also contain stainless steel-lined sumps (to collect spilled liquids), pumps, and motors, which were deactivated shortly after operations ceased in 1954 (R-002085, p. 2). Stainless steel floor and sump details are contained in Drawing Nos. 2828-801-61, -62, -63, -64, -65, -66, and -67 (Appendix B, Drawings). Table 7-1 lists known Building G2 sumps.

Table 7-1. Building G2 Sumps

Location	Notes and References
327-foot level	
G2 Cells Nos. 1 - 5	Each of the 5 cells in G2 has a stainless steel lined sump with a sump pump and motor, disconnected shortly after decommissioning in 1954 (C-000164, p. 6). The sumps were equipped with steam jets (R-000059, p. 15). The floors slope towards the sumps so that materials from tank leaks, vessel overflow, condensate from pressure lines, seepage of ground water, etc., could be collected and pumped (R-000034, p. 65).
G2 Hot and G2 Process Tunnels	A sump is in the center of the G2 Process Tunnel approximately 10 feet south of the north end of G2. A sump is in the center of the G2 Hot Tunnel approximately 10 feet south of the north end of G2 (Drawing G-SF-1).
Pipe, Motor Generator Room, and Pump Room	Condensate was collected in the header into the pipe room sump (C-000015, p. 2, R-000059, p. 21). Valves were put into the discharge lines of the sumps in the pipe room and pump room (R-000034, p. 66).
337-foot level	
Batch Count Extraction	The BCE contained Rooms 151 and 152 sumps (floor drains) (C-002043).
Room 100 Basement Corridor	Alpha contamination around the sump pump was found in 1950 (R-001126). (Room 100 is shown in an area that was the Rotameter Room during SPRU operations) (R-001126).
Autoclave Room Machine Shop (Room 174)	Both the sump and the sump pit are depicted in the upper left quadrant of the drawing (Drawing G2-PE-2520).
Decontaminating Chamber	A sump pit in the corner of the Decontaminating Chamber is sealed and has welded plates over it (R-002085, Drawing 2828-801-67).

Areas converted to offices have suspended acoustical tile ceilings. The 1989 videotape documentation indicates stainless steel ceilings in the cell areas (V-002008).

G2 Walls

Interior G2 reinforced concrete walls up to 5 feet thick confine cell areas; stairways are constructed with concrete blocks. Interior walls are generally sheet metal (R-000059, p. 2). One source describes many walls as explosion-proof (R-001932). Slots in G2 concrete walls were filled with concrete, cleaned, and leak tested after piping was installed (C-000482).

Extensive piping and conduit systems run inside Building G2 walls, as illustrated in Figures 7-5, 7-6, 7-7, and 7-8, and in Appendix B, Drawings, including:

Drawing No. 2828-601-4, Instrument Conduit Layout East Wall-Cells 1 to 4 Inclusive, June 6, 1948
Drawing No. 2828-601-5, Instrument Conduit Layout-Cell 5, June 26, 1948
Drawing No. 2828-601-17, Layout-Instrument Piping Cells to Instrument Board, May 10, 1949
Drawings Nos. 2828-601-18 through 37, Instrument Piping Cells 1 through 5, November 8, 1948 through September 14, 1949

Drawing No. 2828-601-38, Instrument Conduit-Pump Room & Cell 1, May 31, 1949
Drawing No. 2828-601-39, Instrument Conduit-Cells 2, 3, & 4, May 31, 1949
Drawing No. 2828-601-40, Instrument Conduit-Cell 5 & Solvent Storage Area, May 19, 1949.

G2 Roof

The original Building G2 roof was a standard built-up, graveled roof covering 12,000 square feet. The original membrane was replaced in 1984 because of leakage of contaminated water into the building. Facility records show that HEPA-filtered exhausts and exhaust ductwork were present on the roof, probably a cause of the contamination (R-001126, G2 Roof page). After loose roofing materials were removed, the roof was released for unrestricted use. However, according to a 1984 SPRU decommissioning plan, Building G2 and H2 roof leaks were a means of radioactive contamination transport into the building (C-000164, p. 4).

In October 1990, it was determined that fiberglass insulation in collapsed G2 roof ductwork was contaminated with 208 picoCuries total cesium-137. Additionally, mass spectrometry of an insulation sample indicated 2.6 picoCuries of plutonium characterized as slightly atypical SPRU plutonium or typical SPRU material mixed with a small amount of fallout. The ductwork ends were sealed with facilon and no further action was reported. A rip in the facilon covering the G2 plenum was discovered on November 5, 1996. Surveys of insulation that had fallen off the inside of the plenum walls indicated 200 to 500 counts per minute direct probe beta-gamma activity. However, no radioactivity was escaping from the facilon tears and a temporary fix was achieved by sealing the plenum with more facilon (R-001126, Attach. 4, pp. 1-3).

Follow-up surveys detected 100 counts per minute direct probe beta-gamma accessible fixed contamination at the Building G1 and G2 duct break (the elbow). This area also was temporarily stabilized using facilon. Additional G2 plenum insulation sampling and surveys were scheduled to document occupational exposures because pressure differentials and natural building airflow still occurred through the ductwork even though the system was no longer used. The natural flow caused air to exhaust from vents in Rooms 100, 315, and 309 to Rooms 310 and 316 and back into G1 through the G2 Room 310 fire door. The inside surface of vent ducts closest to employee areas were surveyed for alpha, beta-gamma, and plutonium contamination. Results from radiochemistry indicated 3.4 picoCuries of gross alpha activity in Room 100. It is not known if this airflow still occurs (R-001126, Attachment 4, pp. 1-3).

A general roof duct area radiation survey conducted in July of 2000 identified less than 0.05 milliRoentgen per hour for both open window and closed window readings (R-001126, Attachment 5).

G2 Utilities

Electricity is available and lights function in G2 areas that have had regular access, but videotapes show that lighting is sporadic in areas that have not been regularly accessed (e.g., the cells). The Appendix B Drawing No. 2828-900 series provides a source of information on electrical systems.

Building G2 cell area heating and ventilation system is separate from the areas that were eventually used for office space. The original SPRU supply and exhaust ventilation system was completely deactivated after decommissioning in 1954. Supply fans and filters were removed and scrapped. Cell area supply ducts remain, but are sealed at the Cell-Crane Gallery boundary. Exhaust ventilation fans and filter banks originally located in the Lower Filter Area/Welding School and Crane Gallery west side boundary were removed and scrapped and external connections sealed (R-002085, p. 2).

G2 areas converted to offices are still heated with steam, but there are no working lavatories.

Negative pressure for containing airborne radioactive particulate was maintained by two exhaust blowers and six HEPA filters as of November 1992. The blowers and filters are located on the 357-foot level in the exhaust ventilation room. The system exhausts approximately 2000 cubic feet per minute from the cell

area (R-001949, p. 67). Building G2 heating and ventilation systems are shown in Appendix B, Drawing Nos. 2828-401 and –402 series.

7.1 Accessible Areas

Building G2 levels (elevations) and accessibility are described in Table 7-2:

Table 7-2. Building G2 Elevations and Uses

Level/name	Original Design (1949 through 1954)	Current Accessibility (2004)
324-foot level	Solvent Still Area (associated with Cell 5).	Inaccessible
325-foot level	Labyrinth Level (access and solvent still control area) (R-001932, p. 5).	Inaccessible
327-foot level, Basement	Hot and cold utilities and services, pipe room and process equipment control panels. Hot process cells, including shielding walls, corridors, stairs, Pump Room, and service area. The cells are 2 ½ stores high (C-000014, p. 13).	Inaccessible except for the Library Storage Room.
337-foot level, First floor	Laboratories, control room, change areas, and Rotameter Room, Decontamination Chamber and Hoisting Bay (C-000014, p. 13).	Inaccessible in Lower Sampling Aisle and Cell areas. Other areas accessible.
348-foot level, Second floor	Crane Gallery and removable stepped concrete hatches over cells, weight scales, Decontamination Chamber, and Hoisting Bay (C-000014, p. 13).	Inaccessible in Upper Sampling Aisle and Cell areas. Other areas accessible.
357-foot level, Third floor	Exhaust ventilation room, crane gallery tracks and pulleys.	All areas accessible.

Building G2 accessible and inaccessible areas are indicated in Figure 7-9.

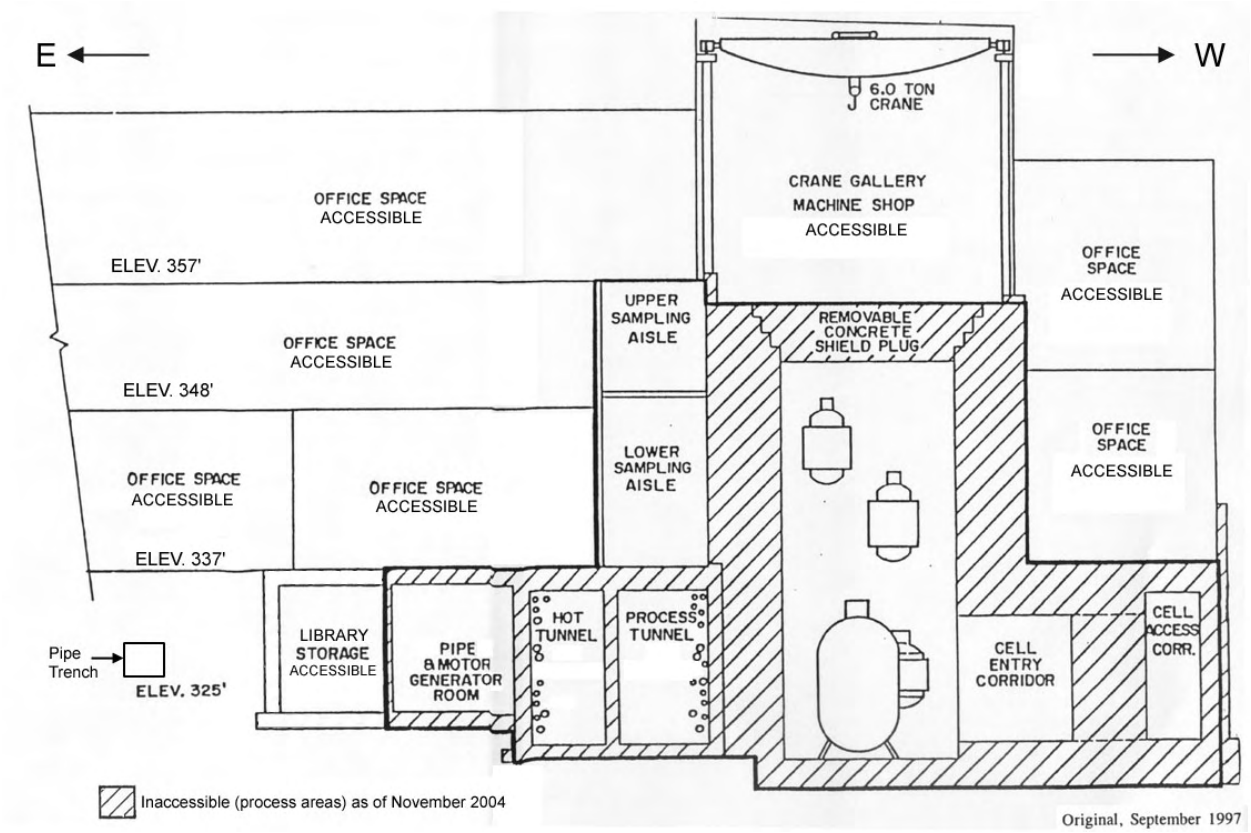


Figure 7-9. G2 Accessible and Inaccessible Areas, November 2004

Accessible and inaccessible areas generally correlate with non-process and process areas. Accessible areas can be entered without dosimetry or protective clothing. Inaccessible areas cannot be entered without dosimetry, protective clothing, respirators, and in some cases, supplied air. Contamination in accessible areas are covered with metal sheeting or wrapped and marked with labels stating "RADIOACTIVITY BEHIND THIS BARRIER." Most accessible areas are empty, but ventilation equipment, some cubicle partitions, cabinets, non-working sinks, cranes, and other equipment remain.

Accessible areas were inventoried in March 1999 (C-001950, Appendix A) and include:

337-Foot Level, Autoclave Testing Room 174 (see Remainder of 337-Foot Level, Machine Shop)

- Two control panels, a resin loop cabinet, two sinks (one described as a pickling sink), a hood, and two 300-liter autoclave heaters in the pit (requires confined space entry). No chemicals remain.
- Hazardous/radiological waste reportedly remains in two old 300-liter heater jackets in the pit.
- Radiological hazards and asbestos-containing materials are in the 300-liter autoclave heater.
- Sinks discharge to city water drains. Eyewash and standpipe by the Room 176 door drain to the KAPL storm sewer (C-001950, Appendix A).

337-Foot Level, Former Feed Tank Farm and Demineralizer System in Room 176 Upper and Lower Levels (see Remainder of 337-Foot Level, Machine Shop)

- Local switches at doorway, breaker panels (south wall), and Upper Level roof fan. Lower Level contains four control panels, local switches, breaker panels, two sinks, and autoclave stands with heaters.
- No chemicals remain in Upper or Lower Levels.
- Hazardous/radiological waste was not reported in Upper or Lower Levels.
- Radiological hazards may exist at several locations. Asbestos-containing materials may be encountered at Lower Level autoclave heaters, cooling water pipes, and autoclave stands. Chemical hazards may exist around the Lower Level caustic autoclave.
- The Lower Level floor drains to the KAPL storm sewer. The drain is reportedly plugged. No Upper Level drainage was reported (C-001950, Appendix A).

337-Foot Level, Room 178 Upper and Lower Level (former Autoclave Test Area) (see Remainder of 337-Foot Level, Truck Dock and Truck Well) (Room 178 and Room 180)

- Upper Level local switches, an old floor fan, Room 180 roof fan controls, and rupture disk assemblies.
- Lower Level control panels, autoclave stands and heaters, workbenches, a bench vise, local switches, and breakers.
- No chemicals reportedly remain in Upper or Lower Level areas.
- Hazardous/radiological waste was reported on the Upper Level. An old floor fan with an unknown history appeared to be affected. No waste was reported on the Lower Level.
- Radiological hazards may exist on Lower and Upper levels. No asbestos-containing materials or chemical hazards were reported on the Upper Level. Asbestos-containing materials on the Lower Level include autoclave heaters and stands.
- A floor drain on the Lower Level leads to the KAPL storm sewer. The drain reportedly is capped (C-001950, Appendix A).

337-Foot Level, Room G2-180/182 (former ALF facility; ALF is the Experimental Engineering Lab designation for the Autoclave) (see Remainder of 337-Foot Level, Truck Dock and Truck Well) (Room 178 and Room 180)

- Old control panel, equipment, test stands with coolers, 6 heater jackets, 10 floor support jackets, local switches, breaker panels, and roof fan controls.
- Property in place includes two sinks, counter tops, a hood, local switches, and breakers.
- No chemicals or hazardous/radiological waste were reported.
- Radiological hazards may exist.
- No asbestos-containing materials or chemical hazards reported.
- Both sinks were reported active, with drains connected to the city water system (C-001950, Appendix A).

7.2 Inaccessible Areas

Entry into inaccessible areas requires personnel protective equipment including supplied air. From May 1989 to October 1989, G2 Hot and Process Tunnels, Sampling Aisles, and Cell inaccessible areas were entered. Videotape V-002008 partially documents excursions into inaccessible areas, which are summarized in the report *Preliminary Evaluation of the Status of the Separation Process Research Unit (SPRU), Draft*, October 1992 (R-001949). Installed lighting was not operational in any of the areas, and many tanks, control panels, piping, and other equipment remained in the inaccessible areas (R-001949, p. 124). Observations of conditions included:

Cells

- Cells are numbered 1 through 5 from north to south.
- Cell area floors were generally clean of debris (R-001949, p. 67).
- A sprayed, strippable film was applied to internal surfaces to prevent adhesion of radioactive contamination to the building structure. The film is generally in good condition; however, some areas have begun to peel or were removed previously for maintenance (R-001949, p. 67). The report text does not state when the film was applied.
- Floors of Cells No. 1 through 4 were lined with stainless steel extending 1 foot up the wall; they were welded, dry, and generally clear of debris (R-001949, p. 124).
- Cell No. 1 had an exterior surface yellow- and brown-colored stain. Plastic wall coating (cocooning) was intact (R-001949, p. 124).
- Cell No. 3 had an oil-like stain on the tank surface and the gearbox directly above the tank (R-001949, p. 124).
- The Cell No. 5 Area E in-floor sump was dry. Overall, the condition of pipe insulation was good, but some deterioration of overhead areas was observed (R-001949, p. 123). A 1- to 2-foot watermark was seen on the Lower Level area wall. Area E showed a brown- and yellow-colored stain on the floor. It was noted that the floor in Cell No. 5 was not painted.

Process and Hot Tunnels

- The Process Tunnel had a layer of dust and rust-colored stains. No pipe leaks were evident or identified during the inspection. Piping and structures were considered sound (V-002008).
- Hot Tunnel concrete, piping, and structures were in good condition. The sump was damp with what appeared to be oil. Dust and rust-colored stains were also observed (V-002008).
- The area where the Process Tunnel and Hot Tunnel meet was damp as the result of water leaking through an expansion joint in the wall (V-002008).

Other Areas

- Both Pipe and Motor Generator Room doors had been sealed with sheet metal barriers to isolate the room from adjacent accessible Library Storage. Piping located on the west wall was in good condition; the rest of the room was empty (R-001949, p. 124).
- A 1- to 2-foot watermark was observed in the Cell Access Corridor, but the floor was dry. A thin strippable floor coating showed evidence of extensive deterioration from walking traffic. The only evidence of leakage was a yellow- and brown-colored stain from an air-sampling pipe. Small areas of oil and/or tar stains on the floor were visible (R-001949, p. 124).
- The Pump Room was dry and clear of debris, equipment, and tools. The in-floor sump was dry. The pump had been removed from the concrete pedestal. Piping was in good shape (R-001949, p. 124).
- The Lower Sampling Aisle was dry and clean with very little dust. Piping and tubing showed no evidence of leakage or deterioration. Four empty barrels were observed in the area (V-002008).
- The Upper Sampling Aisle was dry and clean with very little dust. Piping and tubing showed no evidence of leakage or deterioration. The sample cabinet located furthest north was shielded and reportedly had the highest radiological readings of any area entered (V-002008).

The exterior of G2 has not been modified since construction. Therefore, construction photographs provide insight into current conditions. Appendix C, Photographs, contains the following G2 construction photographs:

G2-1 G2 Under Construction Showing Interior Wall Construction, Summer 1948 (Figure 7-6)
G2-2 G2 Looking North (KS11549), 1948
G2-12 Northeast Corner of G2, May 19, 1948
G2-16 Form for North Wall of G2, April 7, 1948
G2-17 Looking South at G2 and G1, June 1948
G2-18 North West Corner of G2, Annex Excavation, undated
G2-19 G2 Under Construction Shows Steel Framing and Concrete Walls, July 20, 1948 (Figure 7-7)
G2-20 Northeast Corner of G2, July 20, 1948
G2-24 Constant Head Balcony Looking Northwest at Head Balcony and Weigh Tank Floor During Construction, December 22, 1948
G2-25 West Side of Roof on Building G1 Looking North at G2 Annex, December 22, 1948
G2-44 Balcony of G2 Looking West Toward G2 Annex, Showing Piping, November 18, 1948 (Figure 7-5)
G2-45 North at G2 Annex From West of Building G1, May 24, 1949
G2-70 View of Building G2 and G2 Balcony (Facing North East), undated
G2-89 Balcony G2 Looking West Towards G2 Annex, Showing Piping, November 18, 1948

7.3 Potential Radiological and Chemical Contamination in G2

In April 22, 1977, a KAPL Catalogue of Radioactively Contaminated Systems and Components estimated that milligram quantities of plutonium and 50 to 100 Curies of mixed fission products remain in the form of residues on floors, walls, pipes, and process tanks in G2 (C-000445). Radiological survey summaries are provided in each of the sections below that describe the 325/327-foot, 337-foot, 348-foot, and 357-foot levels in G2.

Asbestos, polychlorinated biphenyls, and other chemicals may be present in the SPRU facility, but surveys have not been completed (see Chemical Analysis). The following chemical contaminants may be in Building G2:

- Asbestos contained in building materials such as fireproofing, ventilation materials, piping and other insulation, arc shields, steam flange gaskets, transite paneling, floor tile, exterior asbestos-corrugated material, and mastic and remaining G2 equipment and materials associated with asbestos-containing materials
- Residual chemicals remaining in pipelines that were decontaminated by flushing with dilute nitric acid, drained, and capped and/or valved-off (R-001546, p. G-79)
- Oil product residues (e.g., dust control in the ventilation system, spindle oil, electrical equipment)
- Heavy metals (e.g., mercury and lead) found on painted surfaces and equipment
- Electrical equipment such as switches, relays, wiring, and other onsite equipment such as piping, meters, fluorescent lamps and ballasts, and batteries
- Unidentified sealants and plastic wall materials may require special handling for removal. For example, during the 1998 inspection, a sprayed, strippable film applied to internal surfaces to prevent adhesion of radioactive contamination to the walls was observed (R-001949, p. 67). Chemical constituents of this material were not revealed in documents reviewed. The film generally appeared to be in good condition during 1989 entries into process areas, but some film had peeled away or had been removed previously for maintenance.

7.4 Building G2 325-Foot and 327-Foot Levels

The 325- and 327-foot levels (used interchangeably in this section) comprise the Building G2 basement. It contained the "hot" (radioactive) and "cold" (non-radioactive) utilities and services, Pipe Room and Control Room for the process control panels (C-000014, pp. 3, 13). The remaining basement area includes the two-and-a-half story high hot process cells, including shielding walls, corridors, stairways, the Pump Room, and service area (C-000014, p. 13). The basement floor is a reinforced concrete slab on grade, between 1 and 2 feet thick. No equipment or process lines penetrate the slab to the subsoil (R-001949, p. 76).

Figure 7-10 illustrates the basement configuration as approximated in 2004.

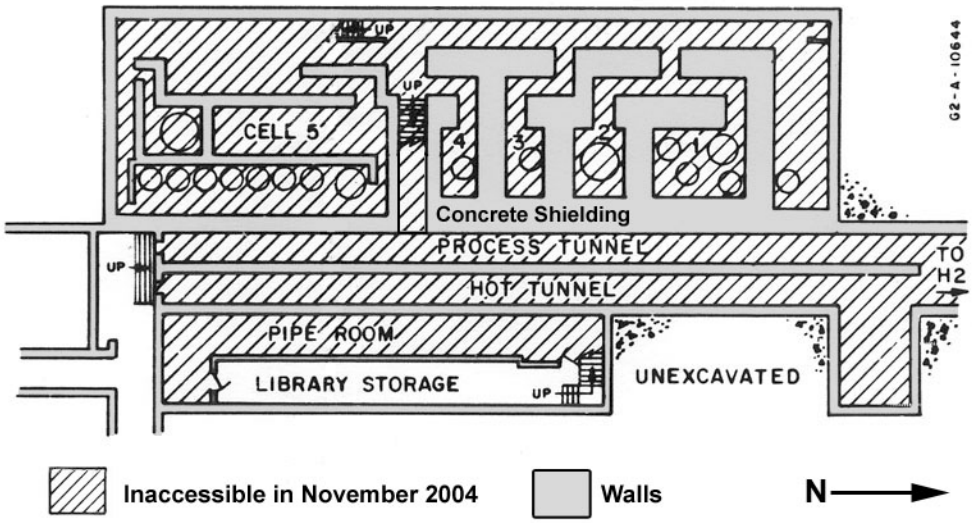


Figure 7-10. Building G2, Basement, 325-Foot Level,
(modified from Drawing No. G2-A-10644, February 17, 1984; approximates 2004 configuration)

Figure 7-11 illustrates the 327-foot level radiological status based on the most recent survey data that is summarized in the sections below. Terminology used in this figure is explained in Table 5-1.

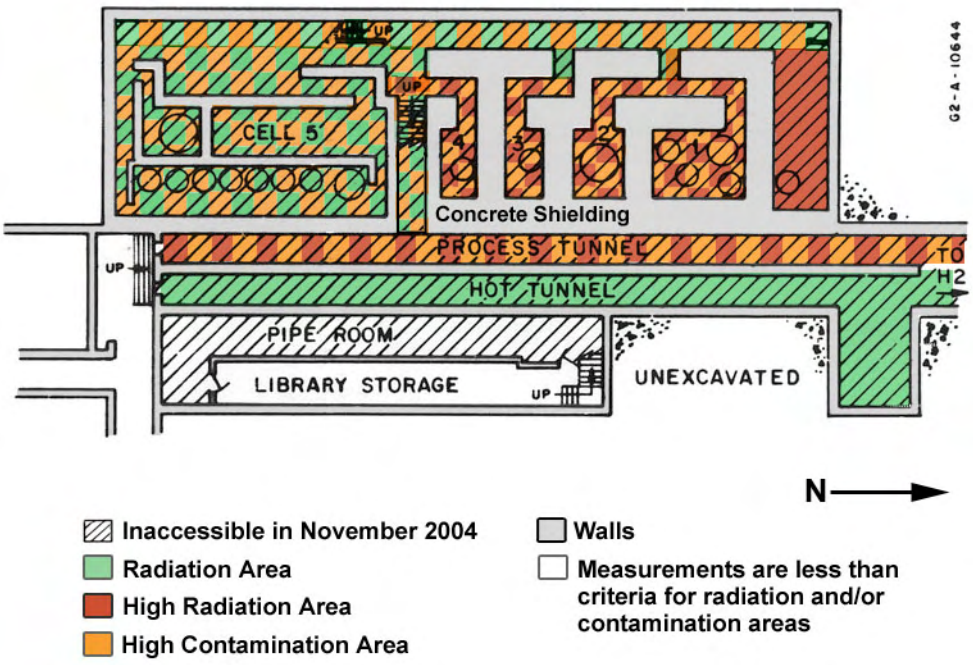


Figure 7-11. Radiological Conditions of the G2 327-Foot Level (based on 1989 survey data [2004 data for Library Storage Room])

All 327-foot level areas except the Library Storage Room are currently inaccessible and under radiological control. The Library Storage Room was measured with a direct frisk/probe during a quarterly survey in August 2004. Survey results indicated less than 450 picoCuries (999 disintegrations per minute) beta-gamma and less than 50 picoCuries (111 disintegrations per minute) alpha. According to survey notes, particular attention was paid to areas with sealed surfaces (R-000525). Therefore, the Library Storage Room is not considered contaminated. Radiation (dose to individuals recorded in Rem per hour) could not be assessed, since the 2004 survey included only contamination measurements. The G2 327-foot level inaccessible areas were last surveyed for radiation in 1989, with the following results.

Cell Nos. 1, 2, 3, and 4 (C-002082, p. 4) – 1 to 100 milliRem per hour closed window and 4 to 300 milliRem per hour open window general area radiation. The survey also identified loose surface alpha contamination from 320 to 3,600 picoCuries per 100 square centimeters (710 to 7,992 disintegrations per minute) and loose surface beta-gamma contamination from 180,000 to greater than 225,000 picoCuries per 100 square centimeters (399,600 to greater than 499,500 disintegrations per minute). Based on the 1989 survey, Cell Nos. 1, 2, 3, and 4 are both high radiation and high contamination areas.

Cell No. 5 (C-002082, p. 3) – less than 0.2 to 5 milliRem per hour closed window and less than 0.2 to 40 milliRem per hour open window general area radiation. Loose surface alpha contamination of floor areas from less than 50 to 700 picoCuries per 100 square centimeters (less than 111 to 1,554 disintegrations per minute) and loose surface beta-gamma contamination of floor areas from less than 450 to greater than 225,000 picoCuries per 100 square centimeters (less than 999 to greater than 499,500 disintegrations per minute) were also identified. Two areas of Cell No. 5 had high radiation readings. A pump in the pump area measured 40 milliRem per hour closed window and 100 milliRem per hour open window, and a flange in the tank room measured 50 milliRem per hour closed window and 350 milliRem per hour open window. Survey results indicate Cell No. 5 is a radiation and high contamination area.

Pump Room (C-002082, pp. 4-5) – general area radiation readings near the west side of the room were 10 milliRem per hour closed window and 80 milliRem per hour open window. A maximum reading of 100 milliRem per hour closed window and 1,200 milliRem per hour open window was taken on a concrete pedestal that previously supported a pump. Based on the survey, the pump room is a high radiation area. Contamination could not be assessed because the 1989 survey included radiation measurements only.

Cell Access Corridor (C-002082, pp. 3-4) – general area radiation readings of 1.2 to 15 milliRem per hour closed window and 1.4 to 80 milliRem per hour open window, with localized floor area readings up to 25 milliRem per hour closed window and 100 milliRem per hour open window. Loose surface alpha contamination from less than 50 to 240 picoCuries per 100 square centimeters (less than 111 to 533 disintegrations per minute) and loose surface beta-gamma contamination from 31,500 to greater than 225,000 picoCuries per 100 square centimeters (69,930 to greater than 499,500 disintegrations per minute) also were identified. The cell access corridor is a radiation and high contamination area.

The Process Tunnel (R-000114, pp. 2-3) – less than 0.2 to 50 milliRem per hour closed window and 0.5 to 250 milliRem per hour open window general area radiation and a maximum localized floor area reading of 150 milliRem per hour closed window and 600 milliRem per hour open window. Loose floor area surface alpha contamination from less than 50 to 100 picoCuries per 100 square centimeters (less than 111 to 222 disintegrations per minute) and loose surface beta-gamma contamination from 1,350 to 67,500 picoCuries per 100 square centimeters (2,997 to 149,850 disintegrations per minute) were also identified. The Process Tunnel is a high radiation and high contamination area.

Hot tunnel (R-000114, p. 3) – one to 10 milliRem per hour closed window and one to 15 milliRem per hour open window general area radiation. The hot tunnel is a radiation area. Contamination could not be assessed because the 1989 survey included radiation measurements only.

Pipe and Motor Generator Room (R-000114, p. 3) – doorway general area radiation of one milliRem per hour closed window and two milliRem per hour open window. The Pipe and Motor Generator Room is not considered a radiation area in its current state. Contamination could not be assessed because the 1989 survey included radiation measurements only.

7.4.1 CELL AREA – INFORMATION COMMON TO CELLS

Chemical separation process research and development was performed in the five cells and supporting areas. The concrete-encased cells contained pipes, tanks, pumps, valves, and measurement devices, stainless steel-lined sumps and sump pumps and motors, which were deactivated shortly after operations ceased in 1954 (R-002085, p. 2). The cells were accessed through a 325-foot level corridor or by crane after removing concrete hatch covers in the Crane Gallery (R-000255, p. 5).

The cells are heavily shielded. Cells No. 1, 2, 3, and 4 are contained within 5 foot thick reinforced concrete shielding walls and ceilings. Cell No. 5 and the Pump Room have varying wall and overhead thicknesses of less than 5 feet. The Pump Room, cell floors, and access aisle floors are completely lined with stainless steel to slightly above the aisle way floor level (R-001949, p. 76).

The cells and aisle and service ways contain deactivated (i.e., drained and isolated) valves, piping and components for hot and cold water, process cooling water, vacuum, breathing air, nitrogen, oxygen, carbon dioxide (for fire protection), compressed air, steam, steam condensate, de-ionized water, concentrated nitric acid and concentrated sodium hydroxide. Piping penetrating the process cell/tunnel common wall was capped with pancake flanges on the tunnel side; tanks were drained and left with the sampling flanges open (R-001949, p. 67). It was noted that a limited amount of piping has been removed since original installation (R-000102, p. 1).

Three phase 208, 220, and 440 volt AC; single phase 110 volt AC; and 125 and 250 volt DC wiring and switches were installed in aisle and service areas, but isolated (e.g., fuses pulled, breakers open, wire to outside disconnected). Temporary lighting powered from outside the cell areas was used during periodic radiological safety inspections after 1954 (R-002085, p. 2). Lighting was not operational during the 1989 investigation (R-001949, p. 65).

After SPRU decommissioning, air supply to the cells was shut off by closing Crane Gallery dampers; however, air exhaust from the cells remained operational (R-000059, p. 3). In December 1960, it was noted that Crane Gallery cell air supply ducts were capped.

The supply and exhaust ventilation system also was deactivated when SPRU was decommissioned. Supply fans and filters were disconnected and removed and supply ductwork in the cell area was sealed at the Cell–Crane Gallery boundary. Original exhaust ventilation fans and filter banks also were removed, external connections sealed, and a HEPA-filtered exhaust system installed. Two exhaust blowers and six HEPA filters in the Exhaust Ventilation Room (southwest corner of the 357-foot level) now maintain negative pressure for airborne radioactive particulate containment. In 1992, this system exhausted approximately 2,000 cubic feet per minute from the cell area (R-001949, p. 67).

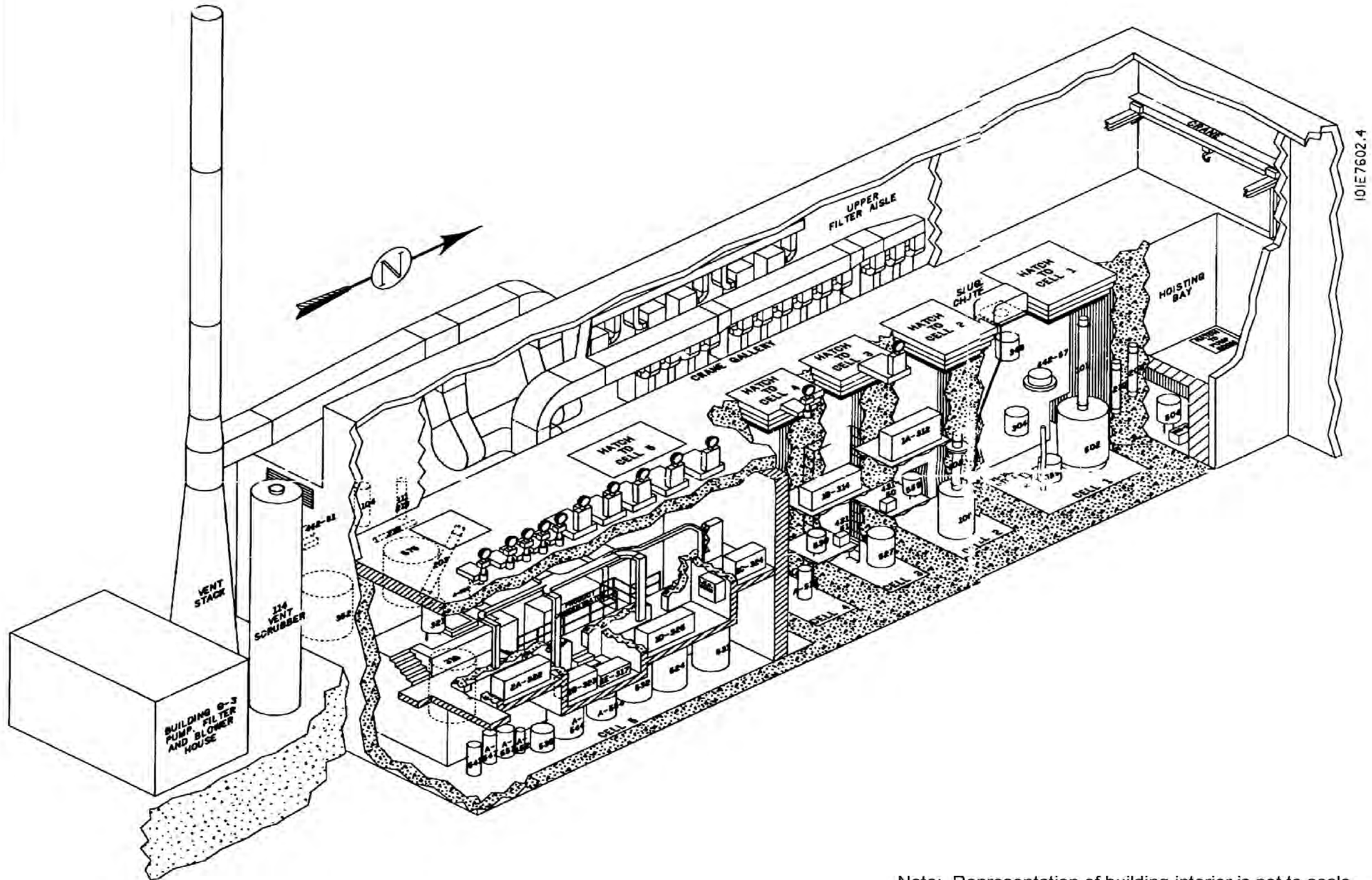
Large, removable concrete plugs originally used for installing and removing large components are located in the floor of the Crane Gallery, over the cells. The plugs were sealed and tiled-over to contain radioactivity, probably in 1954, when equipment in the cells was drained and flushed and stainless steel sumps, sump pumps, and motors were disconnected (C-000164, pp. 6-7).

Figure 7-12, G2 Cell Area Isometric Drawing, illustrates cell configurations. Individual cells are described in subsequent sections.

Documentation indicates that the Cell Nos. 3 and 4 mixer settlers and the Cell No. 5 concentrator ("greenhouse") were removed. The Cell No. 5 concentrator was disassembled and discarded, eliminating the "worst source of Pu contamination in G2" (C-000486).

Chapter 40 of the *Nuclear Safety Manual for the SPRU Cells* (R-000113), July 28, 1964, states that cell radiological controls were maintained by:

- Sealing wall penetrations
- Maintaining negative pressure by a filtered ventilation exhaust system
- Posting and maintaining the area under a locked condition
- Requiring Manager of Plant Operation and Maintenance authorization for SPRU cell area access
- Requiring a health physics personnel escort and monitoring for every entry.



Note: Representation of building interior is not to scale.

Figure 7-12. G2 Cell Area as Constructed in 1949 Isometric Drawing

(Source – R-001949)

7.4.2 CELL NO. 1

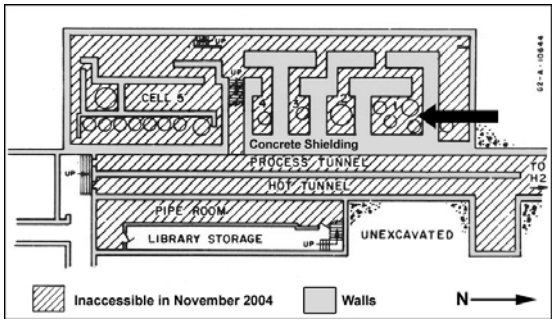


Figure 7-13. G2 325-Foot Level, Cell No. 1

Cell No. 1 Functions

Cell No. 1 was used to scrub dissolver off-gases and prepare hot-feed (R-001932, Section G2, p. 5).

Cell No. 1 Components

Cell No. 1 location is indicated in Figure 7-13 and Table 7-3 describes cell equipment and current condition (REDOX processes are described in R-000022). Cell No. 1 contains the centrifuge initially used for separating dissolved irradiated uranium. A centrifuge remains in the cell (R-000059, Table 1). All systems are reportedly disconnected, drained, and capped.

Table 7-3. Building G2, Cell No. 1 Equipment Summary

Equipment	Qty	Description	Use	Status	Reference
Vent Scrubber Basin (#502)	1	Documents state 1,850 gallons, 1,000 gallons and 1,500 gallons	Scrubbed dissolver off-gases and scrubbed out ruthenium during ruthenium volatilization step (REDOX)	Still in cell as of April 1984	R-001932, G2 section, p. 5; C-000164, p. 6; R-000022, p. 5
Vent Scrubber Column (#101)	1	12 inches OD by 12 feet high; 18 inches OD by 20 feet long	Scrubbed dissolver off-gases and scrubbed out ruthenium during ruthenium volatilization step (REDOX)	Still in cell as of April 1984	R-001932, G2 section, p. 5; C-000164, p. 6; R-000022, p. 5
10 Foot Packing Raschig Rings	1			Unknown	R-001932, G2 section, p. 5
Vent Scrubber Cooler (#208)	1	256 square feet	Cooled solution used to scrub dissolver off-gases	Unknown	R-001932, G2 section, p. 5; R-000022, p. 5
Centrifuge Feed Tank (#346)	1 2	Documents state both 100 gallons, jacket, agitator; and 500 gallons, steam jacketed	Mixed hot feed and scavenging agent	Still in cell as of April 1984	R-001932, G2 section, p. 5; C-000164, p. 6; R-000022, p. 5
Feed Make-up Tank (#304)	1	100 gallons, jacket, agitator	Treated the hot feed chemically	Unknown	R-001932, G2 section, p. 5; R-000022, p. 5
1A Feed Tank (possibly #559)	1	100 gallons, jacket	Measured hot 1A feed rate	Unknown	R-001932, G2 section, p. 5; R-000022, p. 6
Dissolver Off-Gas Scrubber Ejector Condenser	1	105 square feet	Condensed steam from dissolver ejector	Unknown	R-001932, G2 section, p. 5
Centrifuge	1	26 inch Bird solid bowl; about 15 HP motor; 5 feet OD by 3 feet high; 4.8 gal dynamic holdup (REDOX)	Centrifuged solids from hot feed preparation mix	Still in cell as of April 1984	R-001932, G2 section, p. 5; C-000164, p. 6
Flame Arrestors	4	2 inches		Unknown	R-001932, G2 section, p. 5
Pumps	2	10 gpm, 1.5 HP		Unknown	R-001932, G2 section, p. 5

Equipment	Qty	Description	Use	Status	Reference
Sump with Sump Pump and Motor	1	Sump is stainless steel lined		Disconnected in 1954; still in cell as of April 1984	R-001932, G2 section, p. 5; C-000164, p. 6
Bellows Feed Pumps	2	1/20 HP	Hot feed	Still in cell as of April 1984	R-001932, G2 section, p. 5; C-000164, p. 6
Filter and Strainer	1	1AF liquid		Still in cell as of April 1984	R-001932, G2 section, p. 5; C-000164, p. 6
1AF Filters		10 gallons each; Micro Metallic		Unknown	R-000022, p. 6
Filter and Strainer	1	Gas		Still in cell as of April 1984	R-001932, G2 section, p. 5; C-000164, p. 6
Manual and Remote Air Operated Valves	33	½ inch to 2 inches		Unknown	R-001932, G2 section, p. 5
Jets	9	1 inch to 3 inches		Unknown	R-001932, G2 section, p. 5
Pipe Lines	250	Documents state either 3/8 inch to 10 inches and 3/8 inch to 2 inches		Still in cell as of April 1984	R-001932, G2 section, p. 5; C-000164, p. 6
Mercoid Pressure Controller on Bellows Pumps	2			Unknown	R-001932, G2 section, p. 5
Lights	4			Unknown	R-001932, G2 section, p. 5
Shielding	1	5 feet		Still Present	R-001932, G2 section, p. 5
Coolers and Condensers	2	18 inches OD by 15 feet long		Still in cell as of April 1984	C-000164, p. 6
Steam Jet Ejectors	8			Still in cell as of April 1984	C-000164, p. 6
Standpipe	1	2 gallons	Part of 1AF process (REDOX)	Unknown	R-000022, p. 6

Cell No. 1 Configuration

Cell No. 1 is 180 square feet (15 feet long [north-south] by 12 feet long [east-west]), and 27 feet high (R-000059, Table 1; R-000046, p 57).

Cell No. 1 Construction Drawings

Cell No. 1 is described in the following design drawings provided in Appendix B, Drawings:

Drawing No. 2828-1-1, Layout Building G2, March 26, 1948
Drawing No. 2828-1-4, Layout Cell Plan, April 5, 1948
Drawing No. 2828-1-5, Layout Equipment in Cells 1, 2, 3, 4; April 19, 1948
Drawing No. 2828-10-1, Cell Details, April 13, 1948.

Cell No. 1 Photographs

Cell No. 1 is shown in the following Appendix C, Photographs:

Photo G2-21 Cell No. 1 (325-Foot Level), Piping on north side above vent scrubber basin; vent scrubber column (right), undated

Photo G2-22 Cell No. 1 (325-Foot Level), Close-up of vent scrubber column, undated.

Cell No. 1 Radiation Survey History

Cell No. 1 maintenance occurred after the plant was committed to radioactive research and development. At least four events necessitated cell decontamination to reduce dose rates caused by leakage of radioactive material from the centrifuge (R-001949, p. 21).

In February 1954, Cell No. 1 tanks were deemed highly radioactive and extensive decontamination was required before entering the cells for work purposes was permitted (R-000059, p. 7). During an interview in May 2004, it was noted that Cell No. 1 was the most contaminated in SPRU, and that the ceiling was covered with slurry (I-000418).

Table 7-4 provides Cell No. 1 summary radiological data from identified surveys between 1954 and 1989.

Table 7-4. Building G2, Cell No. 1 Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination before shutdown)	Cell No. 1	None	Radiation dose rates: Through door – 50 mR/hr gamma Cell No. 1 panel over top of doorway – 700 mrep/hr beta at 1 inch; 175 mR/hr gamma at 3 inches Open doorway – 4,000 mrep/hr beta; 250 mR/hr gamma	R-000059, p. 24
2/16/1960	Cell No. 1 Floor	Much water found on floor; water level within 2 inches of reaching the access corridor	Dose rates from floor areas of cell: Outside cell door – 50 mR/hr gamma at ~ 2"; 1 rad/hr beta at near contact Just inside cell entryway – 50 mR/hr gamma at ~ 2"; 2.5 rad/hr beta at near contact In cell entryway – 250 mR/hr gamma at ~ 2 inches; 5 rad/hr beta at near contact Through ~10" water on cell floor – 500 mR/hr gamma at ~ 2"; 7.5 rad/hr beta at near contact	C-000098, pp. 1-4
1/23/1964	Entrances to Cell Doors (Cells No. 1-4)	None	Beta-gamma floor contamination – up to 7.0 rad/hr No high level gamma dose rates detected in quick checks inside open cell doors (Cell No. 4 door could not be opened) Gamma radiation – 50 mR/hr to 500 mR/hr Air monitoring in sample aisles, access corridor, and cell areas indicates up to 45 percent of MPC for Pu-239 and beta-gamma up to 60 percent of MPC for SR-90 Shoe covers checked for activity measured up to 10,000 dpm (for sample aisles, access corridor, and cell areas)	C-000112, pp. 1-3
9/1967	Cell No. 1 Floor	None	Dose rate: 500 mrad/hr beta; 310 mR/hr gamma Wet smears: 1,105 dpm/100 cm^2 beta; 27.9 dpm/100 cm^2 alpha	C-000127, p. 2
9/1967	Cell No. 1 Tank	None	Wet smears: 2,528,330 dpm/100 cm^2 beta; 11,785 dpm/100 cm^2 alpha	C-000127, p. 2

Date	Area	Observations	Summary Findings	Reference
3/6/1968	Cell No. 1	None	Floor near entrance - 42 cpm corr and 47 pCi alpha; 1,818 cpm corr and 2,720 pCi beta Floor near entrance - 29 cpm corr and 104 pCi alpha; 224 cpm corr and 2,730 pCi beta Wall by Cell No. 1 - 290 cpm corr and 1,030 pCi alpha; 1,450 cpm corr and 17,800 pCi beta Wall by Cell No. 1 - 241 cpm corr and 855 pCi alpha; 1,046 cpm corr and 12,800 pCi beta	R-000372, pp. 1-2
6/5/1970	Access Corridor and Cell areas	None	Airborne beta-gamma activity measured by lapel air sampler – approximately 5 times the 40 hr concentration guide for Sr-90	C-000130, p. 1
6/29/1989 - 7/13/1989	Cells No. 1 - 4	Cells dry Debris of glass, metal, and other materials on south side of floor in Cell No. 1 In-floor sump in cells is dry Plastic wall coating (cocooning) is intact No evidence of piping or tank leakage or insulation deterioration Tank in Cell No. 1 had yellow and brown colored stain on exterior surface Lighting not operational	General area radiation readings – 1 to 100 mRem/hr closed window and 4 to 300 mRem/hr open window with maximum of 450 mRem/hr open window (Teletector on floor near the tank in Cell No. 1) Loose surface alpha contamination from 320 to 3,600 pCi/100 cm^2 Loose surface beta-gamma contamination from 180,000 to >225,000 pCi/100 cm^2 with 300 to 140,000 pCi/100 cm^2 due to Cs-137 and 2,600 pCi/100 cm^2 of swipe in Cell No. 4 due to Am-241 Maximum contamination measured – 50 mRem/hr/100 cm^2 beta-gamma by open window RO-2 measurement of swipe from floor of Cell No. 1	C-002082, p. 4
6/29/1989 - 7/13/1989	Cells No. 1-4, Cell No. 5 – 1D and 2B-1E Bank Cubicles only, Pump Room, Cell Access Aisle	None	Personal air samplers – maximum measured gross alpha radioactivity of 1.7 x 10^{-11} µCi/ml from Pu-238/239 and maximum measured gross beta radioactivity of 6.7 x 10^{-10} µCi/ml from Cs-137	C-002082, p. 4

In 1952 and 1953, PUREX runs resulted in several leaks, primarily in Cell No. 1. For example, several process line leaks occurred at the head-end equipment location during runs 11, 12, and 13 (R-000041, p. 9; R-000046, p. 57).

Cell No. 1 Potential Chemical Hazards

Chemicals used in the tanks included irradiated uranium (within an aluminum jacket) and 60 percent HNO_3 (nitric acid). Sodium nitrate ($NaNO_3$), part of the dissolver content material associated with Cell No. 1, was transferred from Cell No. 2 (501 tank) to the Cell No.1 centrifuge feed-tank (346 tank).

Other chemicals that were used in the process (but were later flushed during decontamination activities) include: nitric acid (HNO_3), sodium hydroxide (NaOH), and calcium hypochlorite ($Ca(ClO)_2$), hydro-fluoric acid (HF), ammonium bifluoride (NH_4HF_2), and oxalic acid (R-000046, pp. 63, 65). Various decontamination solution concentrations (40 to 325 gallons) were also used (R-000046, p. 65).

7.4.3 CELL NO. 2

Cell No. 2 Functions

Cell No. 2 was used to dissolve slugs. The slugs (in a shielded slug carrier) were delivered to Cell No. 2 using the overhead crane (R-001932, p. 5). A small cell hatch was opened and slugs were released from positioned slug carriers into a 6-inch diameter pipe to a dissolver tank (R-000255, p. 5). Slugs were dissolved in Cell No. 2 before the solution was transferred to the Cell No. 1 centrifuge. The Cell No. 2 501 tank also received materials from the dissolver feed tank (303 tank) and dissolver weigh tank (302 tank) on the weigh tank level.

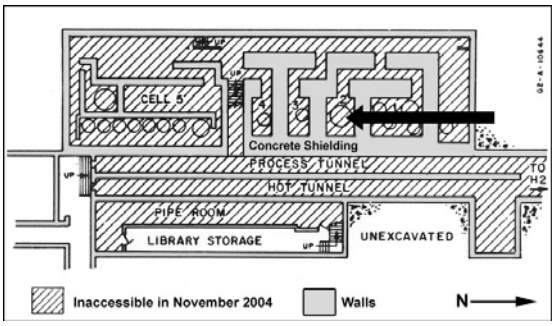


Figure 7-14. G2 325-Foot Level, Cell No. 2

Cell No. 2 Components

Figure 7-14 indicates the Cell No. 2 location. Cell structural and equipment components are in place, but electrical power and equipment systems are disconnected, drained, and vents are covered. The concrete access cover located in the Crane Gallery (355-foot level) is sealed and tiled.

Cell No. 2 has one 480-gallon, jacketed (heated by steam and cooled by cooling water) dissolver tank (501 tank) with a dissolver condenser (201) mounted on top (C-000098, p. 4). A 6-inch diameter slug chute extends from a funnel (with a bolted cover) in the Crane Gallery floor to the dissolver tank. The dissolver is vented through the dissolver condenser (201) and a 6-inch and 8-inch pipe to the vent scrubber basin (502) in Cell No. 1 (R-001949, p. 18).

Table 7-5 describes Cell No. 2 equipment identified in various historical documents and current equipment condition, if known.

Table 7-5. Building G2, Cell No. 2 Equipment Summary

Equipment	Qty	Description	Status	Reference
Dissolver tank (#501)	1	Documents state both 500 gallons, jacketed inner basket and 1,000 gallons	Still in cell as of April 1984	R-001932, Section G2, p. 5; C-000164, p. 7
Dissolver Off-Gas Condenser (#201)	1	22 square feet; 18 inches OD by 15 feet long	Unknown	R-001932, Section G2, p. 5
Jets	6	1 inch to 2 inches	Unknown	R-001932, Section G2, p. 5
Remote Control Valve	1	2 inches	Unknown	R-001932, Section G2, p. 5
Sump with Sump Pump and Motor	1	Sump is stainless steel lined	Disconnected in 1954; Still in cell as of April 1984	R-001932, G2 section, p. 5; C-000164, p. 6
Pipe Lines	~ 20	Documents state both 3/8 inch to 8 inches and 3/4 inch to 8 inches	Still in cell as of April 1984	R-001932, Section G2, p. 5; C-000164, p. 7
Shielding (walls)	1	5 feet	Unknown	R-001932, Section G2, p. 5
Slug Carrier	1		Still in cell as of April 1984	C-000164, p. 7
Slug Carrier Tube	1	18 inches in diameter by 20 feet long	Still in cell as of April 1984	C-000164, p. 7

Equipment	Qty	Description	Status	Reference
Steam Ejectors	5		Still in cell as of April 1984	C-000164, p. 7
Remote and Manually Operated Valves			Still in cell as of April 1984	C-000164, p. 7

Cell No. 2 Configuration

Cell No. 2 is 96 square feet (8 feet long [north-south] by 12 feet long [east-west]), and 27 feet high (R-000059, Table 1). The cell is encased by a 5 foot minimum thick concrete and contains a stainless steel floor pan (R-002047, p. 3).

Cell No. 2 Construction Drawings

The following drawings provided in Appendix B, Drawings depict Cell No. 2 construction:

Drawing No. 2828-1-1, Layout Building G2, March 26, 1948
Drawing No. 2828-1-4, Layout Cell Plan, April 5, 1948
Drawing No. 2828-1-5, Layout Equipment in Cells 1, 2, 3, 4, April 19, 1948
Drawing No. 2828-10-1, Cell Details, April 13, 1948.

Cell No. 2 Photographs

Cell No. 2 is shown in the following Appendix C, Photographs:

Photo G2-10 Cell No. 2 (325-Foot Level), Southeast corner of Cell No. 2 (facing northwest), January 18, 1949
Photo G2-28 Cell No. 2 (325-Foot Level), Vessel 501 - Dissolver Tank in Cell No. 2, undated.

Cell No. 2 Radiation Survey History

In February 1954, Cell No. 2 tanks were considered highly radioactive by the workers (R-000059, p. 7). Table 7-6 provides a summary of Cell No. 2 radiological data from identified surveys conducted between 1954 and 1989.

Table 7-6. Building G2, Cell No. 2 Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	Cell No. 2	None	Radiation dose rates: Base of door – 50 mrep/hr beta at 1 inch; 25 mR/hr gamma at 3 inches Glass window –100 mR/hr gamma at 3 inches Panel over door – 50 mrep/hr beta at 1 inch; 125 mR/hr gamma at 3 inches Open doorway – 250 mrep/hr beta; 250 mR/hr gamma Turn before step off – 10,000 mR/hr gamma	R-000059, p. 24
2/16/1960	Cell No. 2 Floor	Water found on floor; water level within 2 inches of reaching access corridor	Dose rates from floor areas of cell: Outside cell door – 1 R/hr gamma at ~ 2"; 200 mrad/hr beta at near contact Just inside cell entryway – <5 mR/hr gamma at ~ 2"; 500 mrad/hr beta at near contact Through ~10" water on cell floor – 50 mR/hr gamma at ~ 2"; 475 mrad/hr beta at near contact	C-000098, pp. 1-4

Date	Area	Observations	Summary Findings	Reference
1/23/1964	Entrances to Cell Doors (Cells No. 1-4)	None	Beta-gamma floor contamination – up to 7.0 rad/hr No high level gamma dose rates detected in quick checks inside open cell doors Gamma radiation – 50 mR/hr to 500 mR/hr Air monitoring in sample aisles, access corridor, and cell areas indicated up to 45% of MPCa for Pu-239 and beta-gamma up to 60% of MPCa for SR-90 Shoe covers checked for activity measured up to 10,000 dpm (for sample aisles, access corridor, and cell areas)	C-000112, pp. 1-3
7/14/1967	501 Dissolver Tank	Volume of liquid = 8 gallons	Analysis of liquids: Cs-137 – 5,660 µCi, Total alpha – 72 µCi, Approximate pH – 5-6	C-000126, p. 2
9/1967	Cell No. 2 Floor	None	Dose rate: 300 mrad/hr beta; 25 mR/hr gamma Wet smears: 108,980 dpm/100 cm^2 beta; 2,032 dpm/100 cm^2 alpha	C-000127, p. 2
9/1967	Cell No. 2 Tank #501	None	Wet smears: 189.9 dpm/100 cm^2 beta; 1.5 dpm/100 cm^2 alpha	C-000127, p. 2
3/6/1968	Cell No. 2	None	Floor near entrance - 29 cpm corr and 104 pCi alpha; 306 cpm corr and 3,730 pCi beta Floor near entrance - 20 cpm corr and 22 pCi alpha; 1,244 cpm corr and 1,860 pCi beta Wall by Cell No. 2 - 466 cpm corr and 524 pCi alpha; 9,647 cpm corr and 14,450 pCi beta	R-000372, pp. 1-2
6/5/1970	Access Corridor and Cell areas	None	Airborne beta-gamma activity measured by lapel air sampler – approximately 5 times the 40 hr concentration guide for SR-90	C-000130, p. 1
11/11/1971	Cell No. 2	Cell in complete darkness Does not appear to be loose debris in cell	Frisking of filter canisters worn with the clearvue mask in Cells No. 2, 3, and Lower and Upper Sampling Aisles for approximately 45 minutes indicated activity up to 350 cpm Direct radiation measurements: At step off – 60 mRem/hr beta; 10 mR/hr gamma Over sump – 2.7 Rem/hr beta; 10 mR/hr gamma In sump hole – 1 R/hr gamma Floor (back area of cell) – 600 mRem/hr beta; 30 mR/hr gamma Yellow stains on piping – 3 R/hr General cell (head high) – 10 mR/hr gamma Above tank – 10-20 mR/hr gamma Loose surface contamination swipe results: Corridor at step-off – 600 dpm gamma; 30,000 cpm beta-gamma Floor of cell (north) – 24,000 dpm gamma; 25 mRem/hr beta-gamma Floor of cell (by sump) – 3,200 dpm gamma; 10 mRem/hr beta-gamma Wall (South) – 1,200 dpm gamma; 11,000 cpm beta-gamma Yellow stains on tank – 1,800 dpm gamma; 16,000 cpm beta-gamma Floor of cell (rear) – 14,000 dpm gamma; 35 mRem/hr beta-gamma	C-000132, pp. 1-3

Date	Area	Observations	Summary Findings	Reference
6/29/1989 - 7/13/1989	Cells No. 1 - 4	Cells dry In-floor sump is dry Plastic wall coating (cocooning) is intact No evidence of piping or tank leakage or insulation deterioration Lighting not operational	General area radiation readings – 1 to 100 mRem/hr closed window and 4 to 300 mRem/hr open Loose surface alpha contamination from 320 to 3,600 pCi/100 cm^2 Loose surface beta-gamma contamination from 180,000 to >225,000 pCi/100 cm^2 with 300 to 140,000 pCi/100 cm^2 due to Cs-137 and 2,600 pCi/100 cm^2 of swipe in Cell No. 4 due to Am-241 Maximum contamination measured – 50 mRem/hr/100 cm^2 beta-gamma by open window RO-2 measurement of swipe from floor of Cell No. 1	C-002082, p. 4
6/29/1989 - 7/13/1989	Cells No. 1-4, Cell No. 5 – 1D and 2B-1E Bank Cubicles only, Pump Room, Cell Access Aisle	None	Personal air samplers – maximum measured gross alpha radioactivity of 1.7 x 10^{-11} µCi/ml from Pu-238/239 and maximum measured gross beta radioactivity of 6.7 x 10^{-10} µCi/ml from Cs-137	C-002082, p. 4

Cell No. 2 Potential Chemical Hazards

The dissolver (501 tank) received slugs dropped from the G2 Crane Gallery slug chute (Drawing No. 2828-92-1). Other materials were received from the dissolver feed tank (303 tank) and a dissolver weigh tank (302 tank) on the weigh tank level (R-001949, p. 18).

Dissolver tank (501 tank) chemicals included irradiated uranium (within an aluminum jacket that may have contained other metals) and 60 percent HNO_3 (nitric acid), introduced from the dissolver feed tank (303 tank). Sodium nitrate ($NaNO_3$) was introduced into the Tank 501 from another level (possibly the Weigh Tank level). Dissolver tank (501 tank) contents were transferred to the Cell No. 1 centrifuge; therefore, the tanks and pipeline connections should contain similar residual process material. Residual chemicals may remain in Cell No. 2. Decontamination chemicals used for the cells include ammonium bifluoride (NH_4HF_2), calcium hypochlorite ($Ca(ClO)_2$), hydrofluoric acid (HF), nitric acid (HNO_3), oxalic acid, and sodium hydroxide (NaOH) (R-000046, pp. 63, 65).

7.4.4 CELL NO. 3

Cell No. 3 Functions

Cell No. 3 contains the first contacting unit in the first cycle and receiving tanks (R-001932, Section G2, p. 5). Separated slug components dissolved in the Cell No. 1 centrifuge were transferred to Cell No. 3 for further separation into plutonium and uranium through a mixer-settler operation. Tank 527 accumulated aqueous waste (corrosive and containing heavy metals) from February 1950 until October 1953, which was transferred to Building H2 for processing.

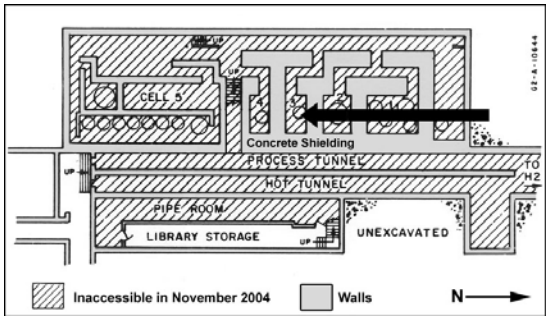


Figure 7-15. G2 325-Foot Level, Cell No. 3

Components in Cell No. 3

The Cell No. 3 location is indicated in Figure 7-15. Cell No. 3 contains Tank 527 (C-000098, p. 4). The 200-gallon capacity 527 tank is stainless steel and measures 3 feet in diameter and 4 feet high. When SPRU was decommissioned, the tank was drained, flushed with a dilute nitric acid solution, and rinsed with water (R-001126, Attachment 2, p. 3). The Cell No. 3 structure has not been modified, but as of 1954, the 1A mixer-settler bank was completely dismounted, piping cut, electrical services disconnected, and the bank vent capped (R-000059, p. 8). The Crane Gallery (355-foot level) concrete access cover was sealed and tiled over. Table 7-7 describes Cell No. 3 equipment identified in various historical documents and current equipment condition, as known.

Table 7-7. Building G2, Cell No. 3 Equipment Summary

Equipment	Qty	Description/Use	Status	Reference
1A Bank – 20 Stage Contactor	1	Enclosed in hood: 20 stirrers and motors, weir box, sample pots, and auxiliary mechanical equipment Separated bulk of fission products from uranium and plutonium	Unknown	R-001932, Section G2, p. 5
Tank	1	20 gallons	Unknown	R-001932, Section G2, p. 5
Aqueous Waste Tank	1	200 gallons; mounted on scale	Unknown	R-001932, Section G2, p. 5
Bellows Pump	1	1/20 HP	Still in cell as of April 1984	R-001932, Section G2, p. 5; C-000164, p. 7
Sump with Sump Pump and Motor	1	Sump is stainless steel lined	Disconnected in 1954; still in cell as of April 1984	R-001932, G2 section, p. 5; C-000164, p. 6
Remote and Manually Operated Valves	5	½ inch to 1 inch	Still in cell as of April 1984	R-001932, Section G2, p. 5; C-000164, p. 7
Pipe Lines	~120	1/8 inch to 4 inches	Unknown	R-001932, Section G2, p. 5
Conduit Runs	30		Unknown	R-001932, Section G2, p. 5
Flow Transmitters	2		Unknown	R-001932, Section G2, p. 5
Flame Arrestors	3		Unknown	R-001932, Section G2, p. 5
Jets	3	1 inch to 2 inches	Unknown	R-001932, Section G2, p. 5
Lights	4		Unknown	R-001932, Section G2, p. 5
Shielding (walls)	1	5 feet	Still present	R-001932, Section G2, p. 5
Holdup Tank	1	500 gallons	Still in cell as of April 1984	C-000164, p. 7
Steam Ejectors	3		Still in cell as of April 1984	C-000164, p. 7
Pipe Lines		Located on upper level of cell, previously connected to mixer settler	Still in cell as of April 1984	C-000164, p. 7
Mixer Settler	1		Removed in 1954	C-000164, p. 7

Cell No. 3 Configuration

Cell No. 3 consists of a bottom level and a bank area. The Cell bottom level is 72 square feet (6 feet [north-south] by 12 feet long [east-west]), and 27 feet high. The Cell No. 3 bank area is 36 square feet, 3 feet (north-south) by 12 feet long (east-west) and 6 feet, 10 inches high (R-000059, Table 1).

The cell is encased in 5 foot minimum thick concrete walls and a 2 foot thick concrete floor lined with a stainless steel floor pan (R-002047, p. 3).

Cell No. 3 Construction Drawings

Cell No. 3 construction is depicted on the following drawings, provided in Appendix B, Drawings:

Drawing No. 2828-1-1, Layout Building G2, March 26, 1948
Drawing No. 2828-1-4, Layout Cell Plan, April 5, 1948
Drawing No. 2828-1-5, Layout Equipment in Cells 1, 2, 3, 4, April 19, 1948
Drawing No. 2828-10-1, Cell Details, April 13, 1948
Figures G-327, G-337, G-349, G-357, SPRU Building G2-Floor Plans, Elevations 337' through 357', ERG, June 2004.

Cell No. 3 Photographs

Cell No. 3 is shown in the following Appendix C, Photographs:

Photo G2-29, Cell No. 3 (325-Foot Level), Mixer-settlers in place before 1965, undated.

Cell No. 3 Radiation Survey History

In February 1954, the tanks in Cell No. 3 were considered sufficiently flushed to permit entry into the cell; however, the 527 tank was still highly contaminated (R-000059, p. 7). Table 7-8 provides Cell No. 3 summary radiological data from identified surveys between 1954 and 1989.

Table 7-8. Building G2, Cell No. 3 Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	Cell No. 3	None	Radiation dose rates: Outside of door – <10 mrep/hr beta at 1 inch; <10 mR/hr gamma at 3 inches Open doorway – 25 mrep/hr beta; <10 mR/hr gamma Step off – 300 mrep/hr beta; 75 mR/hr gamma	R-000059, p. 25
2/16/1960	Cell No. 3 Floor	Water level within 2 inches of reaching access corridor	Dose rates from floor areas of cell: Outside cell door – 1 R/hr gamma at ~ 2"; 500 mrad/hr beta at near contact Just inside cell entryway – <5 mR/hr gamma at ~ 2 inches; 300 mrad/hr beta at near contact Just inside main part of cell – 200 mR/hr gamma at ~ 2"; 6 rad/hr beta at near contact	C-000098, pp. 1-4
1/23/1964	Entrances to Cell Doors (Cells No. 1-4)	None	Beta-gamma floor contamination – up to 7.0 rad/hr No high level gamma dose rates detected in quick checks inside open cell doors Gamma radiation – 50 mR/hr to 500 mR/hr Air monitoring in sample aisles, access corridor, and cell areas indicates up to 45% of MPC for Pu-239 and beta-gamma up to 60% of MPC for Sr-90 Shoe covers checked for activity measured up to	C-000112, pp. 1-3

Date	Area	Observations	Summary Findings	Reference
			10,000 dpm (for sample aisles, access corridor, and cell areas)	
7/14/1967	527 1AW Hold-up Tank	Volume of liquid = 20 gallons	Analysis of liquids: Cs-137 – 540 µCi Total alpha – 60 µCi Approximate pH – 5-6	C-000126, p. 2
9/1967	Cell No. 3 Floor	None	Dose rate: 40 mrad/hr beta; 5 mR/hr gamma Wet smears: 126,700 dpm/100 cm^2 beta; 1,231 dpm/100 cm^2 alpha	C-000127, p. 2
9/1967	Cell No. 3 Tank IAW	None	Wet smears: 8,487 dpm/100 cm^2 beta; 114.4 dpm/100 cm^2 alpha	C-000127, p. 2
3/6/1968	Cell No. 3	None	Floor near entrance - 25 cpm corr and 28 pCi alpha; 1,309 cpm corr and 1,955 pCi beta Floor near entrance - 26 cpm corr and 29 pCi alpha; 1,193 cpm corr and 1,790 pCi beta Wall by Cell No. 3 - 73 cpm corr and 82 pCi alpha; 1,417 cpm corr and 2,123 pCi beta	R-000372, pp. 1-2
6/5/1970	Access Corridor and Cell areas	None	Airborne beta-gamma activity measured by lapel air sampler – approximately 5 times the 40 hr concentration guide for Sr-90	C-000130, p. 1
11/11/1971	Cell No. 3	Cell in complete darkness Does not appear to be loose debris in cell	Frisking of filter canisters worn with the clearvue mask in Cells No. 2, 3, and Lower and Upper Sampling Aisles for approximately 45 minutes indicated activity up to 350 cpm Direct radiation measurements: At step off – 5 mR/hr gamma 15 feet above tank – 40 mR/hr gamma Over sump – 600 mRem/hr beta; 50 mR/hr gamma In sump hole – 500 mR/hr gamma General area around tank – 10-20 mR/hr gamma Loose surface contamination swipe results: Corridor at step-off – 28,000 cpm beta-gamma South wall – 100 dpm gamma; 2,500 cpm beta-gamma North wall – 300 dpm gamma; 3,000 cpm beta-gamma Floor of cell (East) – 4,500 dpm gamma; 10 mRem/hr beta-gamma Surface of tank – 1,200 dpm gamma; 15,000 cpm beta-gamma West wall – 1,200 dpm gamma; 7,000 cpm beta-gamma Floor of cell (West) – 7,200 dpm gamma; 7.5 mRem/hr beta-gamma	C-000132, pp. 2-3
6/29/89 - 7/13/89	Cells No. 1 - 4	Cells dry In-floor sump is dry Plastic wall coating (cocooning) is intact No evidence of piping or tank leakage or insulation deterioration	General area radiation readings – 1 to 100 mRem/hr closed window and 4 to 300 mRem/hr open window Loose surface alpha contamination from 320 to 3,600 pCi/100 cm^2 Loose surface beta-gamma contamination from 180,000 to >225,000 pCi/100 cm^2 with 300 to 140,000 pCi/100 cm^2 due to Cs-137 and 2,600	C-002082, p. 4

Date	Area	Observations	Summary Findings	Reference
		Oil-like stain on surface of tank in Cell No. 3 and on gear box directly above tank Lighting not operational	pCi/100 cm^2 of swipe in Cell No. 4 due to Am-241 Maximum contamination measured – 50 mRem/hr/100 cm^2 beta-gamma by open window RO-2 measurement of swipe from floor of Cell No. 1	
6/29/1989 - 7/13/1989	Cells No. 1-4, Cell No. 5 – 1D and 2B-1E Bank Cubicles only, Pump Room, Cell Access Aisle	None	Personal air samplers – maximum measured gross alpha radioactivity of 1.7 x 10^{-11} µCi/ml from Pu-238/239 and maximum measured gross beta radioactivity of 6.7 x 10^{-10} µCi/ml from Cs-137	C-002082, p. 4

Cell No. 3 Potential Chemical Hazards

The 200-gallon 527 waste tank accumulated aqueous waste containing corrosives and heavy metals from the Cell No. 1 1AF Feed Pump, the 308 tank and 311 tank on the Weigh Tank level, and the 512A tank and 516A tank on the Constant Head Tank level (R-001949, p. 23). This waste stream was described as containing essentially no plutonium or uranium, but most of the fission products (R-001949, p. 24). Tank 527 waste was transferred to the Building H2 335 Neutralizer for processing, and residual tank contents were flushed with a dilute nitric acid solution and rinsed with water (R-001126, Attach. 2, p. 3). It is expected that decontamination solutions are similar to those for Cell No. 1.

7.4.5 CELL NO. 4

Functions Performed in Cell No. 4

The same mixer-settler functions were performed in Cell No. 3 and Cell No. 4, and both were dismantled and shut down in the same way. Cell No. 4 contained the second contactor in the first cycle, in which uranium was separated from plutonium.

Components in Cell No. 4

Figure 7-16 indicates the Cell No. 4 location. Cell components, including receiving vessels were essentially the same as Cell No. 3 (R-001932, p. 5). Table 7-9 summarizes Cell No. 4 equipment identified in the various historical documents and known equipment condition.

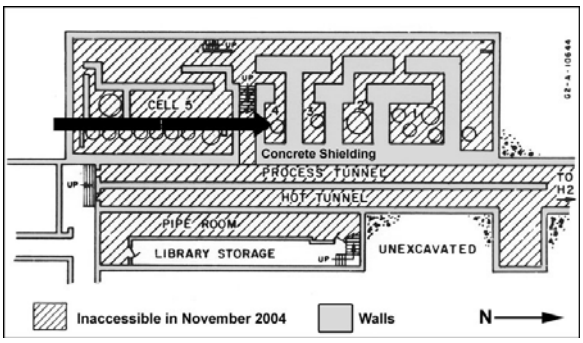


Figure 7-16. Building G2, 325-Foot Level, Cell No. 4

Table 7-9. Building G2, Cell No. 4 Equipment Summary

Equipment	Qty	Description/Use	Current Condition	Reference
1B Bank – 20 Stage Contactor	1	Enclosed in hood: 20 stirrers and motors, weir box, sample pots, and auxiliary mechanical equipment Separated uranium from plutonium	Unknown	R-001932, Section G2, p. 6
Tank	1	20 gallons	Unknown	R-001932, Section G2, p. 6
Tank	1	50 gallons; mounted on scale	Unknown	R-001932, Section G2, p. 6
Bellows Pump	1	1/20 HP	Still in cell as of April 1984	R-001932, Section G2, p. 6; C-000164, p. 7

Equipment	Qty	Description/Use	Current Condition	Reference
Sump with Sump Pump and Motor	1	Sump is stainless steel lined	Disconnected shortly after cessation of operation in 1954; still in cell as of April 1984	R-001932, G2 section, p. 6; C-000164, p. 6
Remote Operated Valves	3	½ inch	Unknown	R-001932, Section G2, p. 6
Remote and Manually Operated Valves	5	½ inch to 1 inch	Still in cell as of April 1984	R-001932, Section G2, p. 6; C-000164, p. 7
Pipe Lines	~120	1/8 inch to 4 inches	Unknown	R-001932, Section G2, p. 6
Conduit Runs	30		Unknown	R-001932, Section G2, p. 6
Flow Transmitters	2		Unknown	R-001932, Section G2, p. 6
Flame Arrestors	3	1 inch to 2 inches	Unknown	R-001932, Section G2, p. 6
Jets	3	1 inch to 2 inches	Unknown	R-001932, Section G2, p. 6
Lights	6		Unknown	R-001932, Section G2, p. 6
Shielding (walls)	1	5 feet	Still present	R-001932, Section G2, p. 6
Holdup Tank	1	500 gallons	Still in cell as of April 1984	C-000164, p. 7
Steam Ejectors	3		Still in cell as of April 1984	C-000164, p. 7
Pipe Lines		Located on upper level of cell, previously connected to mixer settler	Still in cell as of April 1984	C-000164, p. 7
Mixer Settler	1		Removed in 1954	C-000164, p. 7

Cell No. 4 Configuration

Cell No. 4 consists of a bottom level and a bank area. The bottom level is 72 square feet (6 feet wide [north-south] by 12 feet long [east-west], and 27 feet high. The Cell bank area is 36 square feet (3 feet wide [north-south], 12 feet long [east-west], and 8 feet, 8 inches high (R-000059, Table 1). This cell is encased by 5 foot minimum thick concrete and lined with a stainless steel floor pan (R-002047, p. 3).

Cell No. 4 reportedly has not been modified structurally, but the mixer-settler (1B bank) was completely dismounted and removed in 1954. All piping was cut and electrical services disconnected. 1B bank vents were capped (R-000059, p. 8).

Cell No. 4 Construction Drawings

The following drawings depict Cell No. 4 construction and are provided in Appendix B, Drawings:

Drawing No. 2828-10-1, Cell Details, April 13, 1948
Drawing No. 2828-1-1, Layout Building G2, March 26, 1948
Drawing No. 2828-1-4, Layout Cell Plan, April 5, 1948
Drawing No. 2828-1-5, Layout Equipment in Cells 1, 2, 3, 4, April 19, 1948
Figures G2-1 through G2-4, SPRU Building G2-Floor Plans Elevations 327' through 357', October 6, 2000.

Cell No. 4 Photographs

Cell No. 4 is shown in Appendix C, Photographs:

Photo G2-33 Cell No. 4 (325-Foot Level), Top of Vessel A519-Waste Holdup Tank and piping, undated

Photo G2-37 Cell No. 4 (325-Foot Level), Area above top of A519-Waste Holdup Tank (see also G2-33), undated.

Cell No. 4 Radiation Survey History

In February 1954, Cell No. 4 tanks were sufficiently flushed to permit cell entry (R-000059, p. 7). The 1B mixer-settler bank had been removed, piping cut, electrical services disconnected, and the vent capped (R-000059, p. 8). Table 7-10 summarizes Cell No. 4 data from surveys identified between 1954 and 1989.

Table 7-10. Building G2, Cell No. 4 Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	Cell No. 4	None	Radiation dose rates: Outside of door – <10 mrep/hr beta at 1 inch; 40 mR/hr gamma at 3 inches Open doorway – <10 mrep/hr beta; <10 mR/hr gamma Step off – <10 mrep/hr beta; <10 mR/hr gamma	R-000059, p. 25
1/23/1964	Entrances to Cell Doors (Cells No. 1-4)	None	Beta-gamma floor contamination – up to 7.0 rad/hr No high level gamma dose rates detected in quick checks inside open cell doors (Cell No. 4 door could not be opened) Gamma radiation – 50 mR/hr to 500 mR/hr Air monitoring in sample aisles, access corridor, and cell areas indicates up to 45% of MPCa for Pu-239 and beta-gamma up to 60% of MPCa for Sr-90 Shoe covers checked for activity measured up to 10,000 dpm (for sample aisles, access corridor, and cell areas)	C-000112, pp. 1-3
7/14/1967	519 Tank 1BP Storage	Volume of liquid = 50 gallons	Analysis of liquids: Cs-137 – <15 µCi Total alpha – 5 µCi Approximate pH – 5-6	C-000126, p. 2
9/1967	Cell No. 4 Floor	None	Dose rate: 65 mrad/hr beta; 8 mR/hr gamma Wet smears: 78,988 dpm/100 cm^2 beta; 1,148 dpm/100 cm^2 alpha	C-000127, p. 2
9/1967	Cell No. 4 Tank A519 IBP	None	Wet smears: 1,292 dpm/100 cm^2 beta; 70.5 dpm/100 cm^2 alpha	C-000127, p. 2
3/6/1968	Cell No. 4	None	Floor near entrance - 19 cpm corr and 21 pCi alpha; 434 cpm corr and 648 pCi beta Floor near entrance - 6 cpm corr and 7 pCi alpha; 355 cpm corr and 532 pCi beta Wall by Cell No. 4 - 102 cpm corr and 115 pCi alpha; 1,141 cpm corr and 1,710 pCi beta	C-000372, pp. 1-2
6/5/1970	Access Corridor and Cell areas	None	Airborne beta-gamma activity measured by lapel air sampler – approximately 5 times the 40 hr concentration guide for Sr-90	C-000130, p. 1
6/29/89 - 7/13/89	Cells No. 1 - 4	Cells dry In-floor sump is dry Plastic wall coating (cocooning) is intact No evidence of piping or tank	General area radiation readings – 1 to 100 mRem/hr closed window and 4 to 300 mRem/hr open window Loose surface alpha contamination from 320 to 3,600 pCi/100 cm^2 Loose surface beta-gamma contamination from 180,000 to >225,000 pCi/100 cm^2 with 300 to 140,000 pCi/100 cm^2 due to Cs-137 and 2,600 pCi/100 cm^2 of swipe in Cell No. 4 due to Am-241 Maximum contamination measured – 50 mRem/hr/100	C-002082, p. 4

Date	Area	Observations	Summary Findings	Reference
		leakage or insulation deterioration Lighting not operational	cm^2 beta-gamma by open window RO-2 measurement of swipe from Cell No. 1 floor	
6/29/1989 - 7/13/1989	Cells No. 1-4, Cell No. 5 – 1D and 2B-1E Bank Cubicles only, Pump Room, Cell Access Aisle	None	Personal air samplers – maximum measured gross alpha radioactivity of 1.7×10^{-11} µCi/ml from Pu-238/239 and maximum measured gross beta radioactivity of 6.7×10^{-10} µCi/ml from Cs-137	C-002082, p. 4

Cell No. 4 Potential Chemical Hazards

Cell No. 4 and Cell No. 3 performed the same mixer-settler operation and reportedly were dismantled and shut down in the same way. Uranium and plutonium were collected in the Cell No. 4 holdup tank (528 tank) until steady-state conditions were achieved in the 1A Bank (Cell No. 3) and directed to the 1B Bank (Cell No. 4), where the collected material became feed (R-001949, p. 24).

7.4.6 CELL NO. 5

Cell No. 5 Functions

The finishing operation for concentrating plutonium and uranium for packaging and shipment was performed in Cell No. 5.

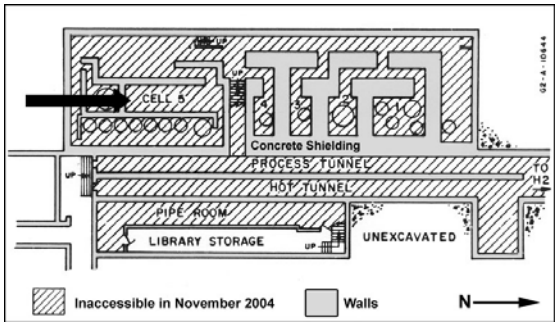


Figure 7-17. Building G2, Basement, 325-Foot Level, Cell No. 5

Cell No. 5 held several rooms, two main working levels, and a moveable shielding wall (C-000164, pp. 6-7, V-002008). The original purpose of the numerous tanks, solvent stills, solvent condensers, reboilers, and receivers in separate Cell No. 5 compartments (as well as in the Crane Gallery) was to receive, store, and purify by distillation the Hexone solvent used in the REDOX process. There is conflicting evidence, however, as to whether or not the distillation supporting REDOX operations ever occurred in the systems. Subsequent to the REDOX runs, Cell No. 5 components were routinely used to wash the tributyl phosphate (TBP) and diluent solvent used in the PUREX process (R-001949, p. 28; R-002087, pp. 21, 22). REDOX process reclaimed solvent was returned to Building G2. PUREX process spent solvent was reclaimed in the Building H2 process and returned to the Cell No. 5 solvent still for reuse.

Cell No. 5 Components

The Cell No. 5 location is indicated in Figure 7-17. The Cell No. 5 structure is intact and equipment and system components also remain, but power is disconnected, systems drained, vents covered, and the Crane Gallery concrete access cover is sealed and tiled over. It is not known if a 1,000-pound capacity, chain hoist stainless steel monorail requested in 1948 (C-000498) was installed on the east and north cell walls.

Five tanks (Tanks 521, 532, 534, 551, and 536) located in the Cell No. 5 Tank Room (east bay) accumulated spent organic solvents or aqueous waste from February 1950 until October 1953. The tanks were drained, flushed with a dilute nitric acid solution, and rinsed with water after SPRU was decommissioned (R-001126, Attach. 2, pp. 3, 4) and are further described as follows:

Tank 316 is located at the south end (316 Cubicle) of Cell No. 5. It is a 1,000-gallon capacity stainless steel tank 5 feet in diameter and 7 feet high.

Table 7-11 describes 1C bank cubicle equipment identified in historical documents and equipment condition, as known. Bank 1C contained the third contacting unit of the first cycle (R 001932, Section G2, p. 6). The Cell No. 5 1D bank cubicle decontaminated and concentrated stream from the 1C bank (R-001932, Section G2, p. 6). Table 7-12 describes equipment used in the 1D bank.

Table 7-11. Building G2, Cell No. 5A, 1C Bank Cubicle Equipment Summary

Equipment	Qty	Description/Use	Status
1C Bank – 10 Stage Contactor	1	Enclosed in hood: 20 stirrers and motors, weir box, sample pots, and auxiliary mechanical equipment. Transferred uranium to aqueous phase	Unknown
Flow Transmitter	1		Unknown
Remote Operated Valves	2	3/8 inch	Unknown
Flame Arrestor	1		Unknown
Conduit Runs	~15		Unknown
Tubing Lines	60	1/8 inch to ¾ inch	Unknown
Pipe Lines	2	2 inches and 3 inches	Unknown
Shielding	1	2 feet	Present
Lights			Unknown

Reference: R-001932, Section G2, p. 6

Table 7-12. Building G2, Cell No. 5B, 1D Bank Cubicle Equipment Summary

Equipment	Qty	Description/Use	Status
CU Concentrator Unit	1	2 evaporators and condensers Evaporated about 40 cc/minute	Unknown
1D Bank – 20 Stage Contactor	1	Enclosed in hood: 20 stirrers and motors, weir box, sample pots, and auxiliary mechanical equipment	Unknown
Flame Arrestor	1		Unknown
Flow Transmitter	3		Unknown
Conduit Runs	~20		Unknown
Tubing Lines	~110	3/8 inch to ¾ inch	Unknown
Pipe Lines	2	2 inches and 4 inches	Unknown
Remote Operated Valves	2		Unknown
Shielding (walls)	1	2 feet	Unknown
Lights			Unknown

Source: R-001932, Section G2, p. 6

Cell No. 5 contained Bank 1E, the last contacting unit in the first cycle and Bank 2B, where the last stage of the second cycle occurred (R-001932, Section G2, p. 6). Table 7-13 describes 2B-1E bank cubicle area equipment identified in historical documents.

Table 7-13. Building G2, Cell No. 5C, 2B-1E Bank Cubicle Equipment Summary

Equipment	Qty	Description/Use	Status
1E Bank – 10 Stage Contactor	1	Enclosed in hood: 20 stirrers and motors, weir box, sample pots, and auxiliary mechanical equipment Transferred Uranium to aqueous phase	Unknown
2B Bank – 10 Stage Contactor	1	Enclosed in hood: 20 stirrers and motors, weir box, sample pots, and auxiliary mechanical equipment Transferred plutonium to aqueous phase	Unknown
Flame Arrestor	2	2 inches	Unknown
Conduit Runs	~20		Unknown
Tubing Lines	~200	1/8 inch to 3/8 inch	Unknown
Pipe Lines	2	2 inches	Unknown
Pipe Lines	1	4 inches	Unknown
Shielding (walls)	1	2 feet	Unknown
Lights			Unknown

Source: R-001932, Section G2, p. 6

The Cell No. 5 2A bank cubicle contained the first contacting unit in the second cycle (R-001932, Section G2, p. 6). Table 7-14 describes the equipment used in the 2A bank.

Table 7-14. Building G2, Cell No. 5D, 2A Bank Cubicle Equipment Summary

Equipment	Quantity	Description/Use	Status
2A Bank – 20 Stage Contactor	1	Enclosed in hood: 20 stirrers and motors, weir box, sample pots, and auxiliary mechanical equipment Decontaminated plutonium stream	Unknown
Flame Arrestor	1	2 inches	Unknown
Conduit Runs	~15		Unknown
Tubing Runs	~100	1/8 inch to 3/8 inch	Unknown
Pipe Lines	6	1 inch to 2 inches	Unknown
Shielding	1	2 feet	Unknown
Lights			Unknown

Reference: R-001932, Section G2, p. 6

The Cell No. 5 Area E contained the crossover oxidizing system for the second plutonium cycle (R-001932, Section G2, p. 7). Table 7-15 describes the equipment used in the Cell No. 5 Area E.

Table 7-15. Building G2, Cell No. 5 Area E Equipment Summary

Equipment	Qty	Description/Use	Status	Reference
Oxidizing Tank (No. 321)	1	100 gallons, jacketed, agitator Oxidized feed for second cycle; Stripped solvent from 1BP, concentrated to flow sheet specifications, and oxidized the plutonium	Unknown	R-001932, Section G2, p. 7; C-000015, p. 1
Receiver	1	30 gallons	Unknown	R-001932, Section G2, p. 7
Crossover Tank Condenser	256 square feet		Unknown	R-001932, Section G2, p. 7
Crossover Tank Column	1	12 inches in diameter by 2 feet packed section Knocked out entrainment	Unknown	R-001932, Section G2, p. 7
Ejector Condenser	1	103 square feet	Unknown	R-001932, Section G2, p. 7
Flame Arrestor	1		Unknown	R-001932, Section G2, p. 7
Jet	1		Unknown	R-001932, Section G2, p. 7
Ejector	1		Unknown	R-001932, Section G2, p. 7
Remove Operated Valves	4		Unknown	R-001932, Section G2, p. 7
Pipe Lines	25	3/8 inch to 4 inches	Unknown	R-001932, Section G2, p. 7
Conduit Runs	5		Unknown	R-001932, Section G2, p. 7
Shielding (walls)	1	18 inches	Unknown	R-001932, Section G2, p. 7
Lights			Unknown	R-001932, Section G2, p. 7

The Cell No. 5 Tank Room (324-foot [lower] level east side) was the receiving area for the contactor discharge streams (R-001932, Section G2, p. 7). Table 7-16 describes Tank Room equipment identified in historical documents. Thirteen tanks were still in place as of September 1967, but the condition of the other equipment is not known.

Table 7-16. Building G2, Cell No. 5, Tank Room Equipment Summary

Equipment	Qty	Description/Use	Status	Reference
Tanks (A552, A554, A553, 541, A547, A550, A549, A551, 1D, A544, 1DW 532, 1EW 534, 1CW 531)	13	10 tanks on scales; 30 to 750 gallons A552 – 2BP Rec A554 – Evap. Cond. A553 – Pu Holdup A551 – 2AW Holdup A544 – 1EW Holdup	All tanks still in cell as of September 1967	R-001932, Section G2, p. 7; C-000127, pp. 2-3
Sump Pump	2		Unknown	R-001932, Section G2, p. 7
Jets	~15		Unknown	R-001932, Section G2, p. 7
Remote Operated Valves	~10		Unknown	R-001932, Section G2, p. 7
Flame Arrestor	4		Unknown	R-001932, Section G2, p. 7

Equipment	Qty	Description/Use	Status	Reference
Flow Transmitter	5		Unknown	R-001932, Section G2, p. 7
Pipe Lines	~200	3/8 inch to 3 inches	Unknown	R-001932, Section G2, p. 7
Conduit Runs	~50		Unknown	R-001932, Section G2, p. 7
Shielding	1	2 feet	Unknown	R-001932, Section G2, p. 7
Lights			Unknown	R-001932, Section G2, p. 7

The second cycle pump area and product concentration area was on the Cell No. 5 324-foot level (R-001932, Section G2, p. 7). Table 7-17 describes Pump Area equipment identified in historical documents.

Table 7-17. Building G2, Cell No. 5, Pump Area Equipment Summary

Equipment	Qty	Description	Status
Bellow Pump	3	1/20 HP	Unknown
Mercoid Pressure Switches	3		Unknown
Centrifugal Pump	2	½ HP, 5 gpm and 1 HP, 5 gpm	Unknown
Remote Operated Valves	7		Unknown
Flame Arrestor	5		Unknown
Flow Transmitter	1		Unknown
Valves	20		Unknown
Piping Runs	15	3/8 inch to 4 inches	Unknown
Conduit Runs	10		Unknown
Concentrator Unit	1		Unknown
Tanks for Concentrator Unit	4	2 to 20 gallons	Unknown
Scales for Concentrator Unit	2		Unknown
Enclosing Greenhouse for Concentrator Unit	1	3 feet by 9 feet by 10 ½ inches	Unknown

Reference: R-001932, Section G2, p. 7

Cell No. 5 Configuration

Cell No. 5 reinforced concrete walls are not as thick as the other four cells. The cell has 2 to 5 foot thick concrete walls and 2 foot thick concrete floor and ceiling and is lined with a stainless steel floor pan (R-002047, p. 3).

Cell No. 5 floor and area dimensions are shown in Table 7-18. Note that these dimensions are from R-000059, Table 1, and 1954 source, and are similar to, but different than those listed in R-001932, pp. 6 and 7, and an undated reference.

Table 7-18. Building G2, Cell No. 5 Area Summary

Area	Floor Space	North-South Length	East-West Length	Height
Pump Area	232 sq. ft.	29 ft.	8 ft.	14 ft., 6 in.
Tank Area	38.4 sq. ft.	5 ft., 9 in.	6 ft., 8 in.	14 ft.
316 Cubicle	76 sq. ft.	9 ft., 6 in.	8 ft.	14 ft., 6 in.
1C Bank Cubicle (No. 5A)	34.5 sq. ft.	5 ft., 9 in.	6 ft.	16 ft.
1D Bank Cubicle (No. 5B)	75 sq. ft.	13 ft., 6 in.	6 ft.	21 ft.
2B-1E Bank Cubicle (No. 5C)	66 sq. ft.	11 ft.	6 ft.	19 ft.
2A Bank Cubicle (No. 5D)	52.5 sq. ft.	8 ft., 9 in.	6 ft.	14 ft.
321 Cubicle (No. 5E)	75 sq. ft.	10 ft.	6 ft., 6 in.	13 ft.

Reference: R-000059, Table 1

Cell No. 5 Construction Drawings

Drawings depicting Cell No. 5 construction and provided in Appendix B, Drawings are:

Drawing No. 2828-1-1, Layout Building G2, March 26, 1948
Drawing No. 2828-1-4, Layout Cell Plan, April 5, 1948
Drawing No. 2828-1-5A, Layout Equipment in Cell No. 5, June 21, 1948
Drawing No. 2828-10-1, Cell Details, April 13, 1948
Drawing No. G2-A-10644, Floor Plans Building G2, February 17, 1984
Figures G-327, G-337, G-349, G-357, SPRU Building G2-Floor Plans, Elevations 337' through 357', ERG, June 2004.

Cell No. 5 Photographs

Cell No. 5 is shown in the following Appendix C, Photographs:

Photo G2-26 Cell No. 5 (325-Foot Level), Interior of Cell No. 5 (facing south) with apparent maintenance/welding underway; workers apparent, undated
Photo G2-31 Cell No. 5 (325-Foot Level), Interior of Cell No. 5 (facing south). Equipment and piping; poor clarity (1949).

Cell No. 5 Radiation Survey History

In February 1954, no Cell No. 5 tanks emitted significant dose rates, some internal contamination existed (R-000059, p. 7). Table 7-19 summarizes Cell No. 5 radiological survey data from identified surveys between 1954 and 1989.

Table 7-19. Building G2, Cell No. 5 Radiological Survey History

Date/Area	Observations	Summary Findings (Reference)
2/22/1954 (following decontamination) Cell No. 5	None	Radiation dose rates: All areas (main) – <6 mrep/hr beta; <6 mR/hr gamma; Sump in tank area – 100 mrep/hr beta at 3 inches; 15 mR/hr gamma at 5 inches (R-000059, p. 25)
2/16/1960 Cell No. 5 (lower level only)	Floor dry (noted that on previous occasions water was present on floor)	Dose rates from floor areas of cell: Step off to Tank Room (on dry cell floor) – 500 mR/hr gamma at ~ 2"; 22.5 rad/hr beta at near contact; Step off to 316 Cubicle– 500 mR/hr gamma at ~ 2 inches; 22.5 rad/hr beta at near contact; Step off to Pump Area– 225 mR/hr gamma at ~ 2"; 3 rad/hr beta at near contact (C-000098, pp. 1-4)

Date/Area	Observations	Summary Findings (Reference)
1/23/1964 Cell No. 5 Area	Area in complete darkness	Radiation levels – 25 mR/hr; gross alpha contamination on floors from 40,000 dpm to 60,000 dpm by direct instrument measurements (loose contamination); Lower floor level for Cell No. 5 (loose surface contamination) – 6,000 dpm alpha and <1 mR/hr, 60 mrad/hr beta-gamma per 100 cm^2 ; Upper floor level for Cell No. 5 (loose surface contamination) – 500 dpm alpha and 2,000 cpm beta-gamma per 100 cm^2; Air monitoring in sample aisles, access corridor, and cell areas indicates up to 45% of MPCa for Pu-239 and beta-gamma up to 60% of MPCa for Sr-90; Shoe covers checked for activity measured up to 10,000 dpm (for sample aisles, access corridor, and cell areas) (C-000112, pp. 1-3)
3/22/66 Access corridor, Cell No. 5 area, entrance to cells	Loose surface contamination on shoe covers	General radiation level: 15 mRem/hr gamma and 250 mRem/hr beta Lower Cell No. 5 area: beta dose rates measured up to 5 Rem/hr and 25 mRem/hr gamma Shoe covers: alpha activity detected at 1,350 pCi/100 cm^2 Filters on masks: indicated 0.7 mRem/hr to 0.8 mRem/hr; beta-gamma calculation indicated 443 times maximum permissible concentration for Sr-90; alpha calculation indicated 340 times maximum permissible concentration for Pu-239 (C-000121, pp. 1-2)
7/14/1967 550 Tank	Volume of liquid = 30 gallons	Analysis of liquids: Cs-137 – 105 µCi; Total alpha – 390 µCi; Approximate pH – 3-4 (C-000126, p. 2)
7/14/1967 541 Cross-over Receiver Tank	Volume of liquid = 30 gallons	Analysis of liquids: Cs-137 – 60 µCi; Total alpha – 60 µCi; Approximate pH – 2-3 (C-000126, p. 2)
7/14/1967 549 2A Bank Feed Tank	Volume of liquid = 30 gallons	Analysis of liquids: Cs-137 – 81 µCi; Total alpha – <1 µCi; Approximate pH – 5-6 (C-000126, p. 2)
7/14/1967 544 1EW Hold-up Tank	Volume of liquid = 60 gallons	Analysis of liquids: Cs-137 – 30 µCi; Total alpha – 18 µCi; Approximate pH – 5-6 (C-000126, p. 2)
7/14/1967 551 2AW Hold-up Tank	Volume of liquid = 20 gallons	Analysis of liquids: Cs-137 – 22 µCi; Total alpha – 16 µCi; Approximate pH – 5-6 (C-000126, p. 2)
7/14/1967 554 Evaporator Condensate Tank	Volume of liquid = 10 gallons	Analysis of liquids: Cs-137 – 9 µCi; Total alpha – 1 µCi; Approximate pH – 5-6 (C-000126, p. 2)
9/1967 Cell No. 5 floor	None	Dose rate: 270 mrad/hr beta; 17 mR/hr gamma Wet smears: 159,528 dpm/100 cm^2 beta; 2,832 dpm/100 cm^2 alpha (C-000127, p. 2)
9/1967 Cell No. 5 Tank	None	Wet smears: 175.5 dpm/100 cm^2 beta; 7.9 dpm/100 cm^2 alpha (C-000127, p. 2)
9/1967 Cell No. 5 floor in pump area near stairs	None	Dose rate: 35 mrad/hr beta; 7 mR/hr gamma Wet smears: 161.4 dpm/100 cm^2 beta; 32.9 dpm/100 cm^2 alpha (C-000127, p. 2)
9/1967 Cell No. 5 321 cubicle floor	None	Dose rate: 12 mrad/hr beta; 1 mR/hr gamma Wet smears: 165.7 dpm/100 cm^2 beta; 15.6 dpm/100 cm^2 alpha (C-000127, p. 2)
9/1967 Cell No. 5 321 Tank	None	Wet smears: 2,346 dpm/100 cm^2 beta; 105 dpm/100 cm^2 alpha (C-000127, p. 2)

Date/Area	Observations	Summary Findings (Reference)
9/1967 Cell No. 5 2A Bank cubicle floor	None	Dose rate: 2 mrad/hr beta; 2 mR/hr gamma Wet smears: 1,224 dpm/100 cm^2 beta; 19.8 dpm/100 cm^2 alpha (C-000127, p. 2)
9/1967 Cell No. 5 2B-1E Bank cubicle floor	None	Dose rate: 3 mrad/hr beta; 1 mR/hr gamma Wet smears: 3,642 dpm/100 cm^2 beta; 228 dpm/100 cm^2 alpha (C-000127, p. 2)
9/1967 Cell No. 5 1D Bank cubicle floor	None	Dose rate: 3 mrad/hr beta; 1 mR/hr gamma Wet smears: 2,741 dpm/100 cm^2 beta; 142 dpm/100 cm^2 alpha (C-000127, p. 2)
9/1967 Cell No. 5 1C Bank cubicle floor	None	Dose rate: 4 mrad/hr beta; 1 mR/hr gamma Wet smears: 2,562 dpm/100 cm^2 beta; 131 dpm/100 cm^2 alpha (C-000127, p. 2)
9/1967 Cell No. 5 Tank Room, Tank A552 – 2BP Rec	None	Wet smears: 3,320 dpm/100 cm^2 beta; 116 dpm/100 cm^2 alpha (C-000127, p. 2)
9/1967 Cell No. 5 Tank Room, Tank A554 – Evap. Cond.	None	Wet smears: 2,077 dpm/100 cm^2 beta; 27.5 dpm/100 cm^2 alpha (C-000127, p. 2)
9/1967 Cell No. 5 Tank Room, Tank A553 – Pu Holdup	None	Wet smears: 3,489 dpm/100 cm^2 beta; 128 dpm/100 cm^2 alpha (C-000127, p. 2)
9/1967 Cell No. 5 Tank Room, Tank 541	None	Wet smears: 3,354 dpm/100 cm^2 beta; 98.3 dpm/100 cm^2 alpha (C-000127, p. 2)
9/1967 Cell No. 5 Tank Room, Tank A547	None	Wet smears: 4,067 dpm/100 cm^2 beta; 86.5 dpm/100 cm^2 alpha (C-000127, p. 3)
9/1967 Cell No. 5 Tank Room, Tank A550	None	Wet smears: 8,947 dpm/100 cm^2 beta; 223 dpm/100 cm^2 alpha (C-000127, p. 3)
9/1967 Cell No. 5 Tank Room, Tank A549	None	Wet smears: 6,002 dpm/100 cm^2 beta; 127 dpm/100 cm^2 alpha (C-000127, p. 3)
9/1967 Cell No. 5 Tank Room, Tank A551 – 2AW Holdup	None	Wet smears: 2,504 dpm/100 cm^2 beta; 349 dpm/100 cm^2 alpha (C-000127, p. 3)
9/1967 Cell No. 5 Tank Room, Tank 1D	None	Wet smears: 5,053 dpm/100 cm^2 beta; 1.3 dpm/100 cm^2 alpha (C-000127, p. 3)
9/1967 Cell No. 5 Tank Room, Tank A544 – 1EW Holdup	None	Wet smears: 5,063 dpm/100 cm^2 beta; 94.5 dpm/100 cm^2 alpha (C-000127, p. 3)
9/1967 Cell No. 5 Tank Room, Tank 1DW 532	None	Wet smears: 3,106 dpm/100 cm^2 beta; 81.4 dpm/100 cm^2 alpha (C-000127, p. 3)
9/1967 Cell No. 5 Tank Room, Tank 1EW 534	None	Wet smears: 2,072 dpm/100 cm^2 beta; 104 dpm/100 cm^2 alpha (C-000127, p. 3)
9/1967 Cell No. 5 Tank Room, Tank 1CW 531	None	Wet smears: 1,880 dpm/100 cm^2 beta; 508 dpm/100 cm^2 alpha (C-000127, p. 3)

Date/Area	Observations	Summary Findings (Reference)
9/1967 Cell No. 5 Tank Room Floor	None	Wet smears: 34,424 dpm/100 cm^2 beta; 537 dpm/100 cm^2 alpha (C-000127, p. 3)
3/6/1968 Cell No. 5	None	Just outside of Cell No. 5 pump area - 33 cpm corr and 117 pCi alpha; 465 cpm corr and 5,700 pCi beta Just outside of Cell No. 5 316 cubicle - <5 cpm corr and <6 pCi alpha; 193 cpm corr and 288 pCi beta Cell No. 5 pump area - 115 cpm corr and 129 pCi alpha; 4,603 cpm corr and 6,900 pCi beta Cell No. 5 tank room - 431 cpm corr and 1,530 pCi alpha; 5,598 cpm corr and 68,600 pCi beta Wall in Cell No. 5 - 68 cpm corr and 241 pCi alpha; 254 cpm corr and 3,120 pCi beta Wall in Cell No. 5 - 16 cpm corr and 57 pCi alpha; 132 cpm corr and 1,615 pCi beta Stairs in Cell No. 5 - 205 cpm corr and 728 pCi alpha; 3,132 cpm corr and 38,300 pCi beta Stairs in Cell No. 5 - 149 cpm corr and 528 pCi alpha; 2,217 cpm corr and 27,200 pCi beta Wall in Cell No. 5 - 156 cpm corr and 175 pCi alpha; 2,997 cpm corr and 4,495 pCi beta Wall in Cell No. 5 - 72 cpm corr and 256 pCi alpha; 466 cpm corr and 5,700 pCi beta (R-000372, p. 2)
6/5/1970 Access Corridor and Cell areas	None	Airborne beta-gamma activity measured by lapel air sampler – approximately 5 times the 40 hr concentration guide for Sr-90 (C-000130, p. 1)
6/25/1971 Access corridors, Cell No. 5	Very dry Loose surface contamination on shoe covers No water conditions evident	Pancake probe on soles of outer shoe covers: 10,000 cpm to 20,000 cpm beta-gamma Johnson meter on soles of outer shoe covers: 200 cpm alpha Air sampler indicated airborne activity of 28 times the CG for Pu-239 and 5 % of the CG for Sr-90 (C-000131)
6/29/1989 – 7/13/1989 Cell No. 5 Complex	In-floor sump in Tank Room dry. Pipe insulation is in good condition with one area of deteriorated insulation in overhead area of 1D Bank cubicle. Piping and tanks show no evidence of damage or leakage. Plastic wall coating (cocooning) covers piping and electric service is largely intact with limited cases of its partial removal in 1C Bank cubicle, 2A Bank cubicle, and 321 cubicle areas. Overall, 1 to 2 foot high watermark on walls in lower level areas. Brown- and yellow-colored stain on floor in Tank Room Floors are dry and free of loose debris with exception of small amount of debris (dust and dirt) found on the floor just inside of the entry door on the upper level Cell is free of tools and equipment with exception of some unused electrical leads on a work bench in the cell access area Ductwork shows no evidence of damage with the exception of a cut-off, open section in the 316 cubicle	General area radiation readings - <0.2 to 5 mRem/hr closed window and <0.2 to 40 mRem/hr open window; two highest radiation readings - a pump in the pump area measured 40 mRem/hr closed window and 100 mRem/hr open window, a flange in the Tank Room measured 50 mRem/hr closed window and 350 mRem/hr open window Air sample data – <1.7 to <2.6 x 10^{-12} µCi/ml gross alpha radioactivity MDA and 3.92 x 10^{-12} to 7.3 x 10^{-11} µCi/ml gross beta radioactivity from Cs-137 in the 316 Cubicle– debris sample from floor just inside the entry door to this area produced 8,684 pCi/gm of Cs-137 Loose surface alpha contamination of floor areas from <50 to 700 pCi/100 cm^2 Loose surface beta-gamma contamination of floor areas from <450 to >225,000 pCi/100 cm^2 with 3,000 to 130,000 pCi/100 cm^2 due to Cs-137 and 1,900 pCi/100 cm^2 of swipe of Tank Room due to Am-241 Maximum contamination measured – 5 mRem/hr/100 cm^2 beta-gamma by open window RO-2 measurement of swipe from floor of Tank Room at the base of a tank (C-002082, p. 3)

Date/Area	Observations	Summary Findings (Reference)
	Process apparatus has been partially disassembled in the 2B-1E Bank cubicle, 1 D Bank cubicle, and 1C Bank cubicle areas It was not determined if a temporary lighting string in this cell was operational as a plug or hardwire connection was not discovered Three emergency escape doors from basement of Cell No. 5 and the Cell Access Aisle are closed	
6/29/1989 - 7/13/1989 Cells No. 1-4, Cell No. 5 – 1D and 2B-1E Bank cubicles only, Pump Room, Cell Access Aisle	None	Personal air samplers – maximum measured gross alpha radioactivity of 1.7 x 10^{-11} µCi/ml from Pu-238/239 and maximum measured gross beta radioactivity of 6.7 x 10^{-10} µCi/ml from Cs-137 (C-002082, pp. 1, 4)
6/29/1989 - 7/13/1989 Lower and Upper Sampling Aisle, Cell No. 5 – 2A Bank and 321 cubicles only	None	Personal air samplers –gross alpha radioactivity from <9.8 x 10^{-13} to <1.2 x 10^{-12} µCi/ml MDA and maximum gross beta radioactivity of 4.4 x 10^{-12} µCi/ml from Cs-137 (C-002082, p. 2)

Cell No. 5 Potential Chemical Hazards

In July 1967, Tanks 531, 532, 534, and 536 were drained, flushed with a dilute nitric acid solution, and rinsed with water and are not likely to contain residual hazardous chemical concentrations (R-001126, Attach. 2, p. 4). Tank 551 was drained when SPRU was decommissioned.

Limited or no chemical specific information was obtained for tanks 547, 552 (receiver tank), or 553 (plutonium-holding tank). Documents did not identify decommissioned or removed tanks or equipment. Therefore, other Cell No. 5 tanks and equipment may remain, including Tanks 316, 536, and 321 (100-gallon oxidizing tank), crossover tank condenser, and the ejector condenser.

7.4.7 PROCESS TUNNEL

Process Tunnel Functions

The Process Tunnel (Figure 7-18) was used for process and service piping (R-001932, p. 5). Process Tunnel pumps, pipes, valves, and measuring equipment carried separation process liquid from G2 to Building H2 for processing. Recovered solvents from Building H2 operations were piped back to G2 cells for reuse.

The Process Tunnel extends through G2 at the 325-foot level, parallel to and west of the Hot Tunnel. At the north end of Building G2, the Process Tunnel and Hot Tunnel merge into the G2-H2 Tunnel. Non-SPRU radioactive waste collection lines also pass through the G2 basement level and the tunnel to the liquid waste treatment systems operating in H2 (C-000164, Enclosure, p. 2).

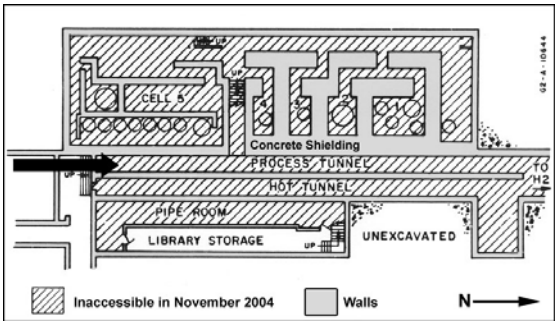


Figure 7-18. Building G2, Basement, 325-Foot Level, Process Tunnel

Process Tunnel Components

Industrial drain systems conveyed chemical waste Buildings D, E, and G2 from the Radioactive Materials Laboratory and Building D3 and G2 to Building H2 for processing. After SPRU was decommissioned, they were flushed with dilute nitric acid, drained, and capped and/or valved (R-001546, p. G-79). Drain lines are fabricated with 2-inch diameter welded stainless steel piping. Process Tunnel headers support pipes from the cell areas that carried process liquids. In 1954 or later, most pipes were cut and capped inside the cells, and abandoned in place in the tunnel.

Process Tunnel Configuration

The Process Tunnel is 663 square feet (112 feet long [north-south] by 5 feet 11 inches wide [east-west]) and 8 feet 9 inches high (R-000059, Table 1). Tunnel walls, floors, and ceilings are constructed of concrete over 6 inches thick and are intact. A waterproof sealant was applied to the tunnel walls and floors during construction. A sump is located in the center of the G2 Process Tunnel approximately 10 feet south of the north end of G2 (Drawing G-SF-1).

Process Tunnel Construction Drawings

The following Appendix B drawings depict Process Tunnel construction:

Drawing No. 2828-701-68, Piping Sections-Hot and Process Tunnel, August 1, 1949
Drawing No. 2828-701-69, Piping Sections-Hot and Process Tunnels, August 24, 1949
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Figure G2-1, SPRU Building G2-Floor Plans, Elevation 327', CH2M Hill, December 6, 2000.

Process Tunnel Photographs

No pictures of the Process Tunnel have been found.

Process Tunnel Radiation Survey History

Table 7-20 provides radiological survey summary data for what is referred to as the G2 Pipe Tunnel from a 1967 survey (C-000127, p. 3). Because this same source provides data for the G2 Hot Tunnel, but not the G2 Process Tunnel, it is assumed that this Pipe Tunnel is the Process Tunnel.

Table 7-20. Building G2, Pipe Tunnel Radiological Survey History

Date	Area	Observations	Summary Findings
9/1967	Entrance to G2 Pipe Tunnel, Floor	None	Dose rate: 50 mrad/hr beta; 5 mR/hr gamma Wet smears: 3,217 dpm/100 cm^2 beta; 37 dpm/100 cm^2 alpha
9/1967	Center of G2 Pipe Tunnel, Floor	None	Dose rate: 40 mrad/hr beta; 5 mR/hr gamma Wet smears: 6,172 dpm/100 cm^2 beta; 57 dpm/100 cm^2 alpha
9/1967	End of G2 Pipe Tunnel, Floor	None	Dose rate: 65 mrad/hr beta; 5 mR/hr gamma Wet smears: 7,704 dpm/100 cm^2 beta; 96 dpm/100 cm^2 alpha

Reference: C-000127, p. 3

Groundwater intrusion at an expansion joint at the north end of Building G2 (in the G2-H2 Tunnel) was observed during a 1989 inspection. High watermarks and stains were also observed on tunnel walls and floors (R-001546, p. G-86). A plan to stop leakage was documented on June 27, 1989 (C-000196, p. 1). Table 7-21 provides Process Tunnel radiological survey summary data from the 1989 survey.

Table 7-21. Building G2, Process Tunnel Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
5/10/1989 - 6/15/1989	Process Tunnel (G2 West Tunnel)	Floors and walls contain several dry-stained areas Piping is intact and shows no evidence of leakage Pipe insulation appears to be in good condition Loose surface contamination Fine layer of white dust on horizontal surfaces (most likely diatomaceous earth) (R-001949, p. 124) No operational lighting.	General area radiation reading – <0.2 to 50 mRem/hr closed window and 0.5 to 250 mRem/hr open window with maximum reading of localized floor area of 150 mRem/hr closed window and 600 mRem/hr open window Air sample data indicated 5.5 x 10^{-12} µCi/ml gross alpha due to U-234 and Pu-238/239 and 4.3 x 10^{-10} µCi/ml gross beta due to Cs-137 Loose surface alpha contamination of floor areas from <50 to 100 pCi/100 cm^2 Loose surface beta-gamma contamination of floor areas from 1,350 to 67,500 pCi/100 cm^2, with 490 to 37,000 pCi/100 cm^2 due to Cs-137	R-000114, pp. 2-3

Potential Process Tunnel Chemical Hazards

Pipelines associated with SPRU operations were reportedly decontaminated (flushed with dilute nitric acid, drained, and capped and/or valved) (R-001546, p. G-79).

Residual chemicals associated with pipe leaks or materials transferred through the tunnel (e.g., solvent mixtures to and from H2) may remain on the tunnel floor and walls. Dry, stained areas and a fine white dust speculated to be diatomaceous earth were observed during the 1989 Radiological Survey. Groundwater intrusion at an expansion joint and water stains also were observed on tunnel walls and floors (R-001546, p. G-86).

7.4.8 HOT TUNNEL

Hot Tunnel Functions

The Hot Tunnel (Figure 7-19) carried radioactive waste through pumps, pipes, valves, and measuring devices to H2 for processing. Support facilities (Buildings E1, G1, D3, D4 and the Radioactive Materials Laboratory) waste also was carried to Building H2 through the Hot Tunnel.

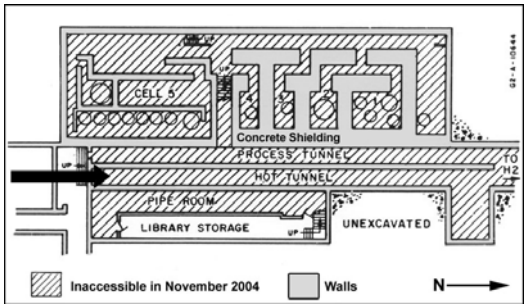


Figure 7-19. Building G2, Basement, 325-Foot Level, Hot Tunnel

Hot Tunnel Components

The Hot Tunnel reportedly remains intact, although some piping (e.g., from laboratory areas) was rerouted, removed or capped and abandoned in place (R-001932, p. 6). Most lines from the KAPL laboratory areas to the Hot Tunnel have been rerouted. A sump is located in the center of the G2 Hot Tunnel approximately 10 feet south of the north end of G2 (Drawing G-SF-1).

Hot Tunnel Configuration

The Hot Tunnel is a reinforced concrete enclosure extending north-south through G2 at the 325-foot level, east of the Process Tunnel. The tunnel is 579 square feet (112 feet long [north-south] by 5 feet 2 inches wide [east-west]), and 8 feet 9 inches high (R-000059, Table 1). The Hot Tunnel structure remains intact, although an unknown amount of piping was rerouted, removed, or capped and abandoned in place (R-001932, p. 6).

Hot Tunnel Construction Drawings

Hot Tunnel construction drawings are provided in Appendix B:

Drawing No. 2828-701-68, Piping Sections-Hot and Process Tunnels, August 1, 1949
Drawing No. 2828-701-69, Piping Sections-Hot and Process Tunnels, August 24, 1949
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Figure G-337, SPRU Building G2-Floor Plans, Elevation 337', ERG, June 2004.

Hot Tunnel Photographs

No Hot Tunnel photographs have been found.

Hot Tunnel Radiation Survey History

Table 7-22 provides 1967 and 1989 Hot Tunnel radiological survey summary data.

Table 7-22. Building G2, Hot Tunnel Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
9/1967	Entrance to G2 Hot Tunnel, Floor	None	Dose rate: 135 mrad/hr beta; 12 mR/hr gamma Wet smears: 8,745 dpm/100 cm^2 beta; 182 dpm/100 cm^2 alpha	C-000127, p. 3
9/1967	Center of G2 Hot Tunnel, Floor	None	Dose rate: 160 mrad/hr beta; 15 mR/hr gamma Wet smears: 6,921 dpm/100 cm^2 beta; 169 dpm/100 cm^2 alpha	C-000127, p. 3
9/1967	End of G2 Hot Tunnel, Floor	None	Dose rate: 200 mrad/hr beta; 18 mR/hr gamma Wet smears: 5,993 dpm/100 cm^2 beta; 142 dpm/100 cm^2 alpha	C-000127, p. 3
5/10/1989 – 6/15/1989	Hot Tunnel (G2 East Tunnel)	Floors and walls contain several dry-stained areas Piping appears to be intact with no evidence of insulation degradation No evidence of piping leakage Some debris and materials (tools and wood planking) remain at south end from previous work Northeast corner contains an alcove, with an overhead loading door heading outdoors; small amount of drippage observed through this loading door Floor is dry Installed lighting not operational (R-001949, p. 125)	General area radiation reading – 1 to 10 mRem/hr closed window and 1 to 15 mRem/hr open window with readings on floor sump and stained area of floor both at 1 mRem/hr closed window and 5 mRem/hr open window Air sample data indicated <6.8×10^{-12} µCi/ml gross alpha MDA and 9.8×10^{-11} µCi/ml gross beta due to Cs-137 Personal air sampler – maximum beta-gamma radioactivity found during inspection of Hot Tunnel and G2-H2 Tunnel – 4.5×10^{-10} µCi/ml from Cs-137	R-000114, p. 3

Potential Hot Tunnel Chemical Hazards

Hot Tunnel piping may contain chemical hazards. A radiation survey performed in 1989 revealed floors and walls contain several dry-stained areas and apparent water intrusion near an overhead door, but no piping leaks were observed.

7.4.9 PIPE AND MOTOR GENERATOR ROOM

Pipe and Motor Generator Room Functions

The Pipe and Motor Generator Room (Figure 7-20) accommodated service and process pipes to and from cell areas. The motor generator provided power and controls for tank, mixer, and centrifuge agitators.

Pipe and Motor Generator Room Components

The Pipe and Motor Generator Room, located in the truck dock area, contains approximately 115 Tymatrol controls for AC motors installed in the Pipe Room, and a stainless steel sump (C-000015, p. 2, R-000059, p. 21). Decontamination information is not available (R-001935, p. 8).

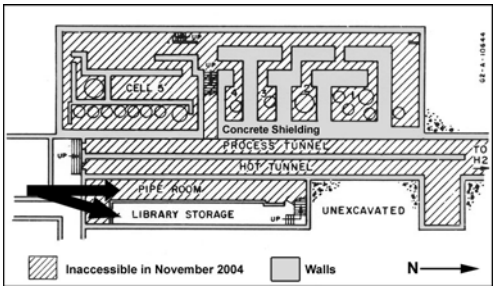


Figure 7-20. Building G2, Basement, 325-Foot Level, Pipe and Motor Generator Room

Pipe and Motor Generator Room Configuration and Modifications

The Pipe and Motor Generator Room is 1,122 square feet (75 feet 8 inches long [north-south] by 14 feet 10 inches wide) and 8 feet 9 inches high (R-000059, Table 1). Originally, the room was a single space adjacent to the Hot Tunnel, but it was divided in half by a floor-to-ceiling wall and the east side was converted to an accessible library storage area between 1954 and 1960. The Pipe Room contained contactor motor control equipment, process gauge valves, miscellaneous piping, and valves (R-001932, p. 3). The inaccessible portion of the Pipe and Motor Generator Room portion is intact.

Pipe and Motor Generator Room Construction Drawings

Pipe and Motor Generator Room construction and subsequent modifications are depicted in the following Appendix B, Drawings:

Drawing No. 2828-701-57, Pipe Room Plans at Elevation 334', November 28, 1948
Drawing No. 2828-701-58, Sections Y and Z, Pipe Room, November 29, 1948
Drawing No. 2828-701-59, Sections W and X, Pipe Room, November 29, 1948
Drawing No. 2828-701-60, Pipe Room Plan at Elevation 336', November 29, 1948
Drawing No. G2-A-2401, OBS Modification Floor Plan, January 13, 1960
Figure G2-1, SPRU Building G2-Floor Plan Elevation 327', CH2M HILL, December 6, 2000.

Pipe and Motor Generator Room Photographs

Pipe and Motor Generator Room features are shown in Appendix C photograph G2-52, Northwest Corner of G2 Pipe Room Looking South, April 25, 1949. The library storage area is currently empty and shown in Figures 7-21, 7-22, and 7-23 as it appeared in 2004.

Figure 7-21. Photo G2-121, Building G2 325-Foot Level Library Storage Room, 2004

Figure 7-22. Photo G2-122, 325-Foot Level Library Storage Covered Piping, 2004

Figure 7-23. Photo G2-123, 325-Foot Level Library Storage 3, Sealed Panels, 2004

Radiation Survey History

Table 7-23 provides Pipe and Motor Generator Room radiological summary data from surveys performed in 1954 and 1989.

Table 7-23. Building G2, Pipe and Motor Generator Room Radiological Survey History

Date	Area	Observations	Summary Findings/ Reference
2/22/1954 (following decontamination)	Pipe Room	None	Smear Results (on approximately 6 square feet of surface): Floor near H. Ph. Air sampler - <200 dpm alpha; <200 cpm beta-gamma; Foot of stairs - <200 dpm alpha; 500 cpm beta-gamma; Floor around sump - <200 dpm alpha; <200 cpm beta-gamma (R-000059, p. 21)
5/10/1989 - 6/15/1989	Motor Generator Room	Area dry; Area relatively free of debris and equipment; Both interior doors sealed with sheet metal barriers from an adjacent storage area of Building G2; Piping along west wall appeared in good condition; No pipe insulation observed	General area radiation reading in doorway – 1 mRem/hr closed window and 2 mRem/hr open window Air sample data indicated <2.4 x 10^{-12} µCi/ml gross alpha MDA and <3.5 x 10^{-12} µCi/ml gross beta MDA (R-000114, p. 3)

7.4.10 CELL ACCESS CORRIDOR

Cell Access Corridor Functions

The Cell Access Corridor extends along the 327-foot level west wall, providing access to the five cells through intersecting corridors (Figure 7-24).

Cell Access Corridor Components

The corridor servicing the Pump Room, cells, stairwell, and passageway and access to the solvent still area in Cell No. 5 comprise the Cell Access Corridor.

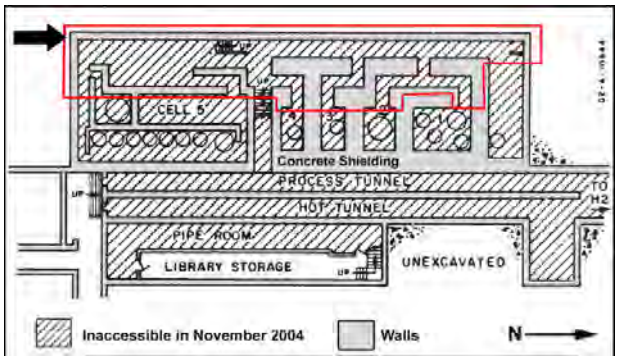


Figure 7-24. Building G2, Basement, 325-Foot Level, Cell Access Corridor

Cell Access Corridor Configuration

Cell Access Corridor walls vary in thickness from 2 feet to 5 feet (R-002047, p. 3). On November 11, 1967, the corridor was painted (R-000371, p. 3).

Cell Access Corridor floor areas and dimensions are summarized in Table 7-24 (R-000059, Table 1).

Table 7-24. Building G2, Cell Access Area Summary

Area	Floor Space	North-South Length	East-West Length	Height
Outside of Pump Room and Cells 1 through 4	256 sq. ft.	64 ft.	4 ft.	9 ft., 11 in.
Bottom of Stairway	72 sq. ft.	6 ft.	12 ft.	9 ft., 11 in.
Passageway to Solvent Still Area	49 sq. ft.	14 ft.	3 ft., 6 in.	9 ft., 11 in.
Access to Solvent Still Area and Cell No. 5	288 sq. ft.	24 ft.	12 ft.	9 ft., 11 in.

Cell Access Corridor Modifications Since Initial Construction

Cell Access Corridor utilities and the ventilation system have been cut off, but the structure remains intact. The exhaust system is active, providing negative pressure relative to the surrounding areas. The corridor did not contain equipment except for the remaining Cell No. 5 Solvent Still.

Cell Access Corridor Construction Drawings

Drawings depicting Cell Access Corridor construction are provided in Appendix B, Drawings:

Drawing No. 2828-1-4, Layout Cell Plan, April 5, 1948
Drawing No. 2828-10-1, Cell Details, April 13, 1948
Drawing No. 2828-701-54, Piping Plan of Utility Piping in Access Tunnel, June 6, 1949
Drawing No. 2828-601-14, Instrument Piping Details-Solvent Still Panel, March 18, 1949
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Figure G2-1, SPRU Building G2-Floor Plan Elevation 327', CH2M HILL, December 6, 2000.

Cell Access Corridor Photograph

G2-14, Cell Access Corridor (327-Foot Level), Cell Access Aisle, Looking North. Lighting, Cables, Overhead Piping, undated.

Cell Access Corridor Radiation Survey History

Table 7-25 provides Cell Access Corridor radiological summary data from surveys conducted between 1954 and 1989.

Table 7-25. Building G2, Cell Access Corridor Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	Cell Access Corridor	None	Smear Results (on approximately 6 square feet of surface): Stairs - 400 dpm alpha; 10,000 cpm beta-gamma North of breathing air header – 1,200 dpm alpha; 10,000 cpm beta-gamma Cell No. 1 and 2 access -1,000 dpm alpha; 8,000 cpm beta-gamma Middle of cell access corridor – 1,000 dpm alpha; 7,500 cpm beta-gamma Cell No. 3 access - 1,200 dpm alpha; 10,000 cpm beta-gamma Cell No. 4 access - 3,200 dpm alpha; 5,500 cpm beta-gamma Cell No. 5 access – 1,000 dpm alpha; 5,000 cpm beta-gamma Middle of solvent still panel access - 1,200 dpm alpha; 7,500 cpm beta-gamma	R-000059, p. 22
2/16/1960	Access Corridor Floor	None	Dose rates from floor areas: Outside Cells No. 1-4 – 20 mR/hr gamma at ~ 2"; 650 mrad/hr beta at near contact Outside of Pump Room area – 25 mR/hr gamma at ~ 2 inches; 1 rad/hr beta at near contact Outside of Cell No. 4 area – 10 mR/hr gamma at ~ 2"; 600 mrad/hr beta at near contact Outside of Cell No. 5, Pump area – 5 mR/hr gamma at ~ 2"; 15 mrad/hr beta at near contact Outside of Cell No. 5, 316 cubicle area – 8 mR/hr gamma at ~ 2"; 300 mrad/hr beta at near contact	C-000098, pp. 1-4
1/23/1964	Cell Access Corridor	None	Radiation levels – 15 mR/hr to 25 mR/hr gamma and 200 to 400 mrad/hr beta approximately 3 feet above floor Alpha contamination – 500 to 1,000 dpm Surface beta measurements on floor – 5 rad/hr to 7.5 rad/hr Alpha detectable on floor by direct instrument readings – 40,000 to 80,000 dpm Floor area in access corridor by sample aisle stairs (loose surface contamination) – 2,000 dpm alpha and 20,000 cpm beta gamma per 100 cm^2 Floor area in access corridor to Cell No. 1 (loose surface contamination) – 3,000 dpm alpha and <1 mR/hr, 15 mrad/hr beta-gamma per 100 cm^2 Floor area in access corridor to Cell No. 2 (loose surface contamination) – 3,000 dpm alpha and 10,000 cpm beta-gamma per 100 cm^2 Floor area in access corridor to Cell No. 3 (loose surface contamination) – 3,000 dpm alpha and 10,000 cpm beta-gamma per 100 cm^2	C-000112, pp. 1-3

Date	Area	Observations	Summary Findings	Reference
			Floor area in access corridor to Cell No. 4 (loose surface contamination) – 2,000 dpm alpha and 12,000 cpm beta-gamma per 100 cm^2 Air monitoring in sample aisles, access corridor, and cell areas indicates up to 45% of MPCa for Pu-239 and beta-gamma up to 60% of MPCa for Sr-90 Shoe covers checked for activity measured up to 10,000 dpm (for sample aisles, access corridor, and cell areas)	
3/22/66	Access Corridor, Cell No. 5 Area, Entrance to Cells	Loose surface contamination on shoe covers	General radiation level: 15 mRem/hr gamma and 250 mRem/hr beta approximately 3 feet from floor Floor contamination evidenced in access corridor south to Cell No. 5 – 5 Rem/hr at 3 inches Shoe covers: alpha activity detected at 1,350 pCi/100 cm^2 Filters on masks: indicated 0.7 mRem/hr to 0.8 mRem/hr; beta-gamma calculation indicated 443 times maximum permissible concentration for Sr-90; alpha calculation indicated 340 times maximum permissible concentration for Pu-239	C-000121, pp. 1-2
9/1967	Access Corridor, in front of Pump Room	None	Dose rate: 340 mrad/hr beta; 25 mR/hr gamma Wet smears: 12,740 dpm/100 cm^2 beta; 107 dpm/100 cm^2 alpha	C-000127, p. 2
9/1967	Access Corridor, in front of Cell No. 1	None	Dose rate: 350 mrad/hr beta; 15 mR/hr gamma Wet smears: 15,760 dpm/100 cm^2 beta; 220 dpm/100 cm^2 alpha	C-000127, p. 2
9/1967	Access Corridor, in front of Cell No. 3	None	Dose rate: 100 mrad/hr beta; 6 mR/hr gamma Wet smears: 210,540 dpm/100 cm^2 beta; 1,322 dpm/100 cm^2 alpha	C-000127, p. 2
9/1967	Access Corridor, in front of Stairs	None	Dose rate: 290 mrad/hr beta; 12 mR/hr gamma Wet smears: 11,784 dpm/100 cm^2 beta; 95 dpm/100 cm^2 alpha	C-000127, p. 2
9/1967	Access Corridor, in front of Work Bench	None	Dose rate: 220 mrad/hr beta; 15 mR/hr gamma Wet smears: 31,029 dpm/100 cm^2 beta; 184.2 dpm/100 cm^2 alpha	C-000127, p. 2
9/1967	Access Corridor, in front of Solvent Still Cell No. 5 Access	None	Dose rate: 100 mrad/hr beta; 45 mR/hr gamma Wet smears: 2,273 dpm/100 cm^2 beta; 24.7 dpm/100 cm^2 alpha	C-000127, p. 2
3/6/1968	Access Corridor	None	East part of stairs between Cell No. 4 and Cell No. 5 - <5 cpm corr and <6 pCi alpha; 128 cpm corr and 192 pCi beta Middle part of stairs between Cell No. 4 and Cell No. 5 - <5 cpm corr and <6 pCi alpha; 172 cpm corr and 258 pCi beta West part of stairs between Cell No. 4 and Cell No. 5 - 7 cpm corr and 8 pCi alpha; 259 cpm corr and 389 pCi beta Outside of Pump Room/Cell No. 1 - <5 cpm corr and <6 pCi alpha; 396 cpm corr and 594 pCi beta Outside of Cell No. 1 - 7 cpm corr and 8 pCi alpha; 298 cpm corr and 447 pCi beta Wall - 37 cpm corr and 133 pCi alpha; 226 cpm corr	R-000372, pp. 1-2

Date	Area	Observations	Summary Findings	Reference
			and 2,760 pCi beta Wall - 18 cpm corr and 64 pCi alpha; 264 cpm corr and 3,220 pCi beta Middle of corridor outside of Cell No. 3 and Cell No. 4 - 17 cpm corr and 19 pCi alpha; 701 cpm corr and 1,052 pCi beta Wall - 83 cpm corr and 93 pCi alpha; 1,231 cpm corr and 1,845 pCi beta	
6/5/1970	Access Corridor and Cell areas	None	Airborne beta-gamma activity measured by lapel air sampler – approximately 5 times the 40 hr concentration guide for Sr-90 Loose surface contamination evident in access corridor from frisking of shoe covers – 400 cpm to 50,000 cpm beta-gamma using pancake probe and 100 cpm to 200 cpm alpha using Johnson meter	C-000130, p. 1
6/25/1971	Access Corridors, Cell No. 5	Very dry Loose surface contamination No water conditions evident	Pancake probe on soles of outer shoe covers: 10,000 cpm to 20,000 cpm beta-gamma Johnson meter on soles of outer shoe covers: 200 cpm alpha Swipes taken along access corridor: loose surface contamination up to 100 pCi/100 cm^2 alpha and up to 100,000 pCi/100 cm^2 beta-gamma Air sampler indicated airborne activity of 28 times the CG for Pu-239 and 5% of the CG for Sr-90	C-000131
6/29/1989 - 7/13/1989	Cell Access Aisle	1 to 2 foot high watermark on walls Floor is dry A thin strippable floor coating shows extensive evidence of deterioration Only evidence of leakage is a yellow- and brown-colored stain from an installed air sampling pipe Two small areas of oil and/or tar stains on floor No operational lighting	General area radiation readings – 1.2 to 15 mRem/hr closed window and 1.4 to 80 mRem/hr open window with localized readings of floor areas up to 25 mRem/hr closed window and 100 mRem/hr open window Air sample data indicated 2.3 x 10^{-11} µCi/ml gross alpha radioactivity from Pu-238/239 and 1.2 x 10^{-9} µCi/ml gross beta radioactivity from Cs-137 (from outside of the Pump Room) Loose surface alpha contamination from <50 to 240 pCi/100 cm^2 Loose surface beta-gamma contamination from 31,500 to >225,000 pCi/100 cm^2 with 11,000 to 130,000 pCi/100 cm^2 due to Cs-137 and 240 to 420 pCi/100 cm^2 due to Am-241 Maximum contamination measured – 6 mRem/hr/100 cm^2 beta-gamma by open window RO-2 measurement of swipe from floor near the bottom of the stairs leading up to the Lower Sample Aisle	C-002082, pp. 3-4
6/29/1989 - 7/13/1989	Cells No. 1-4, Cell No. 5 – 1D and 2B-1E Bank Cubicles only, Pump Room, Cell Access Aisle	None	Personal air samplers – maximum measured gross alpha radioactivity of 1.7 x 10^{-11} µCi/ml from Pu-238/239 and maximum measured gross beta radioactivity of 6.7 x 10^{-10} µCi/ml from Cs-137	C-002082, p. 4

7.4.11 PUMP ROOM

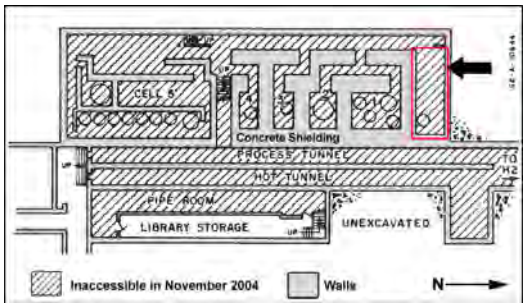


Figure 7-25. Building G2, Basement, 325-Foot Level, Pump Room

Pump Room Function

The Pump Room (Figure 7-25) was used for the auxiliary IAF hot feed system (R-001932, p. 5). It contains a steel floor pan (R-002047, p. 3).

Pump Room Components

Pump Room contents in April 1984 included (C-000164, p. 6):

- One tank, approximately 100 gallons
- Several small pumps and filters
- Remotely and manually operated valves
- Piping ranging between 1½ inches to ½ inch in size.

The Pump Room contains a stainless steel sump (R-001949, p. 124).

Pump Room Configuration

The Pump Room is 243 square feet (9 feet wide [north-south] by 27 feet long [east-west]) and 11 feet high (R-000059, Table 1). The Pump Room area summary is provided in Table 7-26.

Table 7-26. Building G2 Pump Room Area Summary

Area	Floor Space	North-South Length	East-West Length	Height
Outside of Pump Room and Cells 1 through 4	256 sq. ft.	64 ft.	4 ft.	9 ft., 11 in.
Bottom of Stairway	72 sq. ft.	6 ft.	12 ft.	9 ft., 11 in.
Passageway to Solvent Still Area	49 sq. ft.	14 ft.	3 ft., 6 in.	9 ft., 11 in.
Access to Solvent Still Area and Cell No. 5	288 sq. ft.	24 ft.	12 ft.	9 ft., 11 in.

Pump Room Radiological Survey History

The Pump Room radiological history is provided in Table 7-27.

Table 7-27. Building G2, Pump Room Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/16/1960	Pump Room Floor	Water level within 2 in. of reaching access corridor	Dose rates from floor area: Through ~ 10 in. water on cell floor – 50 mR/hr gamma at ~ 2 in.; 250 mrad/hr beta at near contact	C-000098, pp. 1-4
9/1967	Pump Room Floor	None	Dose rate: 500 mrad/hr beta; 40 mR/hr gamma Wet smears: 7,046 dpm/100 cm^2 beta; 242 dpm/100 cm^2 alpha	C-000127, p. 2
9/1967	Pump Room Tank – 504 MCH	None	Wet smears: 5,740 dpm/100 cm^2 beta; 198 dpm/100 cm^2 alpha	C-000127, p. 2
3/6/1968	Pump Room	None	Floor (near back of room) - 24 cpm corr and 27 pCi alpha; 781 cpm corr and 1,170 pCi beta Floor (near middle of room) - 11 cpm corr and 12 pCi alpha; 705 cpm corr and 1,058 pCi beta Floor (near front of room) - 13 cpm corr and 15 pCi alpha; 370 cpm corr and 555 pCi beta	R-000372, p. 1
6/29/1989 - 7/13/1989	Pump Room	Area dry and free of debris, equipment, and tools In-floor sump is dry No evidence of damage to piping or insulation Pump has been removed from concrete pedestal Lighting not operational	General area radiation reading near west side of this area – 10 mRem/hr closed window and 80 mRem/hr open window Maximum reading on concrete pedestal which previously supported a pump – 100 mRem/hr closed window and 1,200 mRem/hr open window	C-002082, pp. 4-5
6/29/1989 - 7/13/1989	Cells No. 1-4, Cell No. 5 – 1D and 2B-1E Bank Cubicles only, Pump Room, Cell Access Aisle	None	Personal air samplers – maximum measured gross alpha radioactivity of 1.7 x 10^{-11} µCi/ml from Pu-238/239 and maximum measured gross beta radioactivity of 6.7 x 10^{-10} µCi/ml from Cs-137	C-002082, p. 4

Construction Drawings for the Remainder of the 327-Foot Level

Construction drawings of the remainder of the 327-foot level are provided in Appendix B, Drawings and include:

Drawing No. 2828-1-2, Layout Typical Elevation, April 4, 1948
Drawing No. 2828-1-4, Layout Cell Plan, April 5, 1948
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1948
Figure G2-1, SPRU Building G2-Floor Plan Elevation 327', CH2M HILL, December 6, 2000.

7.4.12 PIPE TRENCH

A pipe trench runs north and south, east of the Pipe and Motor Generator Room, separated from the 327-foot level by an unexcavated area of soil. The pipe trench slopes 1/8 inch per foot to the south, connecting pipes to the G2 tunnels (Drawing No. G-SF-1). Pipes drained from the 337-foot level laboratories to the pipe trench, which grades to the south, to connect to pipes in the Crossover Tunnel. The trench is approximately 72 feet long, and 2.5 to 3.5 feet deep. Figure 7-26 indicates the pipe trench location.

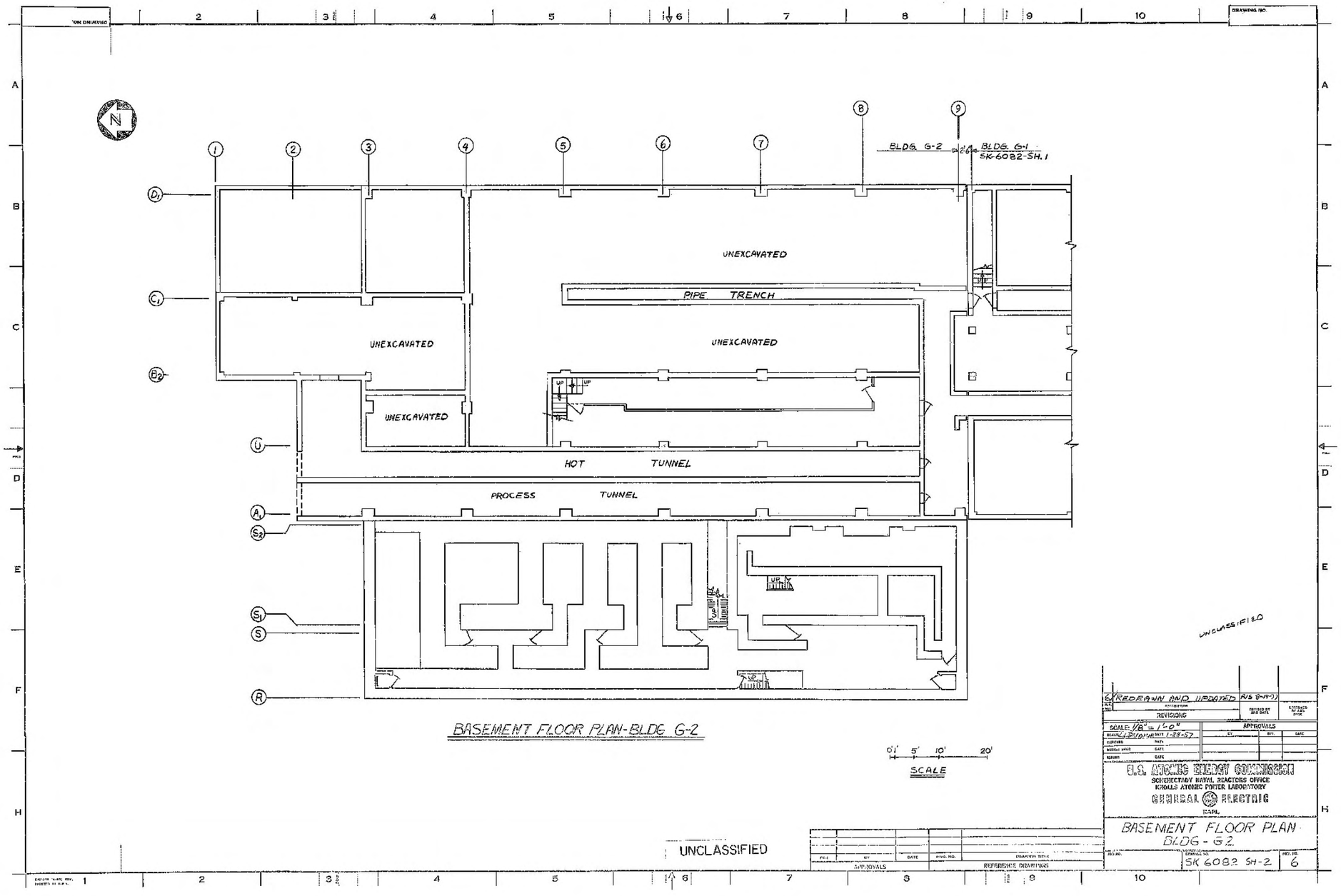


Figure 7-26. Drawing No. G-SF-1, Building G2 Basement Floor Plan Showing Pipe Trench, January 28, 1957

7.5 Building G2 337-Foot Level

The Building G2 entrance is at grade level, on the 337-foot level north side. The building first floor is approximately 8,530 square feet and contains the Decontaminating Chamber, Lower Filter Room, Hoisting Bay, Lower Sample Aisle, change and wash rooms, and the Rotameter Room (C-000014, p. 13).

Figure 7-27 approximates the Building G2 first floor configuration.

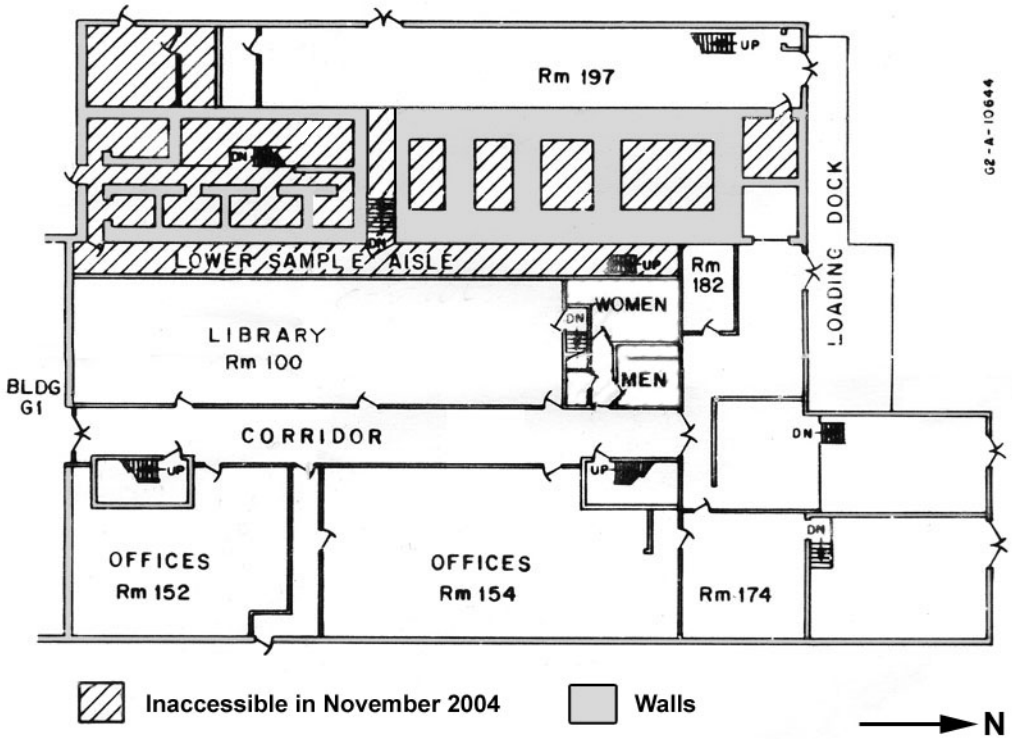


Figure 7-27. Building G2, First Floor, 337-Foot Level, (modified from Drawing No. G2-A-10644, February 17, 1984; approximates 2004 configuration)

Current Building G2 337-foot level conditions are the result of the following modifications:

- Lower Sampling Aisle, Spent Solvent Area, Solvent Storage Area, Decontaminating Chamber Room, and Hoisting Bay were not used after SPRU operations.
- One of the filter rooms (Upper or Lower Filter Room) was modified and converted to a laundry facility in 1961; the reference is not specific as to which (C-000106, pp. 1-2). The Lower Filter Room is now office space.
- The clean and contaminated change and washrooms were converted to restrooms (men and women) and a janitorial closet.
- The Control Room and lower portion of the Rotameter Room are currently Room 100, formerly the KAPL technical library. The Lower Sampling Aisle is west of Room 100.
- The Instrument Shop, BCE cell, and Make-up and Dilution Area were modified for office space (Rooms 152 and 154). Lead shielding covers approximately 25 feet by 25 feet of Room 154 floor area.
- The Machine Shop, Inert Gas Room, Truck Well, and Truck Dock were converted to Experimental Engineering Laboratories autoclave rooms 174, 176, 178, and 180.

- A storage and paint room was modified as an Experimental Engineering Laboratories sludge lab (Room 182).

Figure 7-28 illustrates the current configuration and radiological status of the 337-foot level. Terminology used in this figure is explained in Table 5-1.

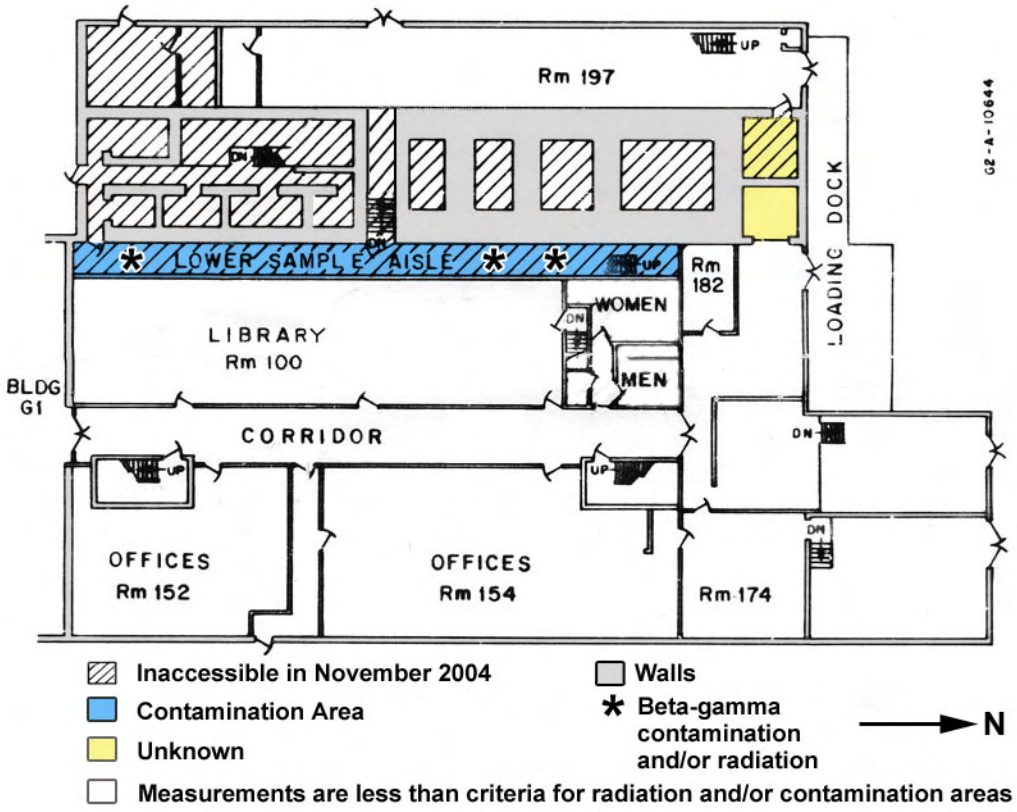


Figure 7-28. Radiological Conditions of the G2 337-Foot Level (based on data from 1989 and 2004 survey data)

The Lower Sampling Aisle and Decontaminating Chamber are currently under radiological control and inaccessible. Accessible 337-foot level areas (except the hoisting bay) were measured with a direct frisk/probe during a routine quarterly survey in July 2004. Survey notes indicated particular attention to areas with sealed surfaces (R-000525). The survey identified less than 450 picoCuries (999 disintegrations per minute) beta-gamma and less than 50 picoCuries (111 disintegrations per minute) alpha. Therefore, accessible 337-foot level areas are not currently considered contaminated. Radiation could not be assessed because the 2004 survey only included contamination measurements.

The last known Lower Sampling Aisle survey was conducted in 1989 (C-002082, p. 2). The survey identified loose surface beta-gamma contamination of floor areas from less than 450 to 2,250 picoCuries per 100 square centimeters (999 to 4,995 disintegrations per minute). Based on this survey, the Lower Sampling Aisle is a contamination area. Radiation (dose to individuals recorded in Rem per hour) could not be assessed because the 1989 survey only measured contamination.

No current or historical Decontaminating Chamber or Hoisting Bay survey information was identified.

7.5.1 DECONTAMINATING CHAMBER

The Decontaminating Chamber is left of the Building G2 north entry doors, directly across from a small room with unknown contents (Figures 7-29, 7-30, and 7-31).

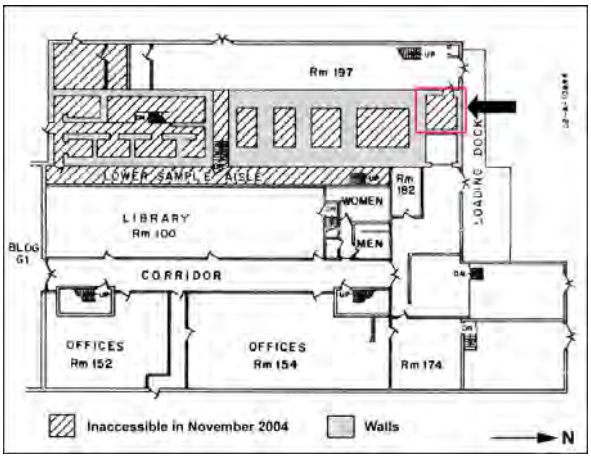


Figure 7-29. G2 337-Foot Level, Decontaminating Chamber

Decontaminating Chamber Functions

The Decontaminating Chamber was an explosion-proof room used to decontaminate tools and equipment (R-001932, p. 9).

Decontaminating Chamber Components

Chamber equipment consisted of six chemical feed lines and valves, lights, and a floor drain (R-001932, p. 9). A sump pit in the corner of the Decontaminating Chamber is sealed and has welded plates over it (R-002085 and Drawing 2828-801-67). The room is inaccessible (November 2004), but a transparent plastic barrier covers the opening and the room appears empty.

Decontaminating Chamber Configuration

The chamber is 10 feet by 10 feet and 27 feet high, extending to the 357-foot level (Crane Gallery) (R-001932, p. 9).

Modifications to the Decontaminating Chamber Since Initial Construction

The Decontaminating Chamber is intact, but the function was modified when a glove box was added in the Filter Area doorway.

Decontaminating Chamber Construction Drawings

The following Decontaminating Chamber construction drawings are provided in Appendix B, Drawings:

Drawing No. 2828-1-1, Layout Building G2, March 26, 1948
Drawing No. 2828-1-6, Layout Plan View Below Roofs, April 23, 1948
Drawing No. 2828-801-2, First Floor Plan- Elevation 337', July 20, 1948
Drawing No. 2828-801-3, Balcony Floor Plan- Elevation 350'-6", July 22, 1948
Drawing No. 2828-801-4, Plan – Crane Gallery and Weigh Tank, July 20, 1948
Drawing No. 2828-801-23, Crane Gallery Floor Plan, November 22, 1948
Figures G-337, -349, -357, SPRU Building G2-Floor Plans, Elevations 337' through 357', ERG, June 2004.

Decontaminating Chamber Photos

Figure 7-30. Photo G2-104, G2 337-Foot Level, Decontamination Chamber inside North Entrance, November 2004

Figure 7-31. Photo G2-141, G2 337-Foot Level, Door West of Decontaminating Chamber, November 2004

Decontaminating Chamber Radiation Survey History

No Decontaminating Chamber radiation survey history was found.

7.5.2 LOWER FILTER AISLE

The former Lower Filter Aisle (currently Room 197) was directly inside the Building G2 north doors. Stairs on the right access the 348-foot level and the 337-foot level (Figure 7-32).

Lower Filter Aisle Functions

Lower and upper filter area blowers exhausted process area air through filters and directly into the Building G2 stack (R-000059, p. 3). The room also served as miscellaneous storage space (R-001932, p. 8).

Lower Filter Aisle Components

This area has some counter tops, but was otherwise empty as of November 2004.

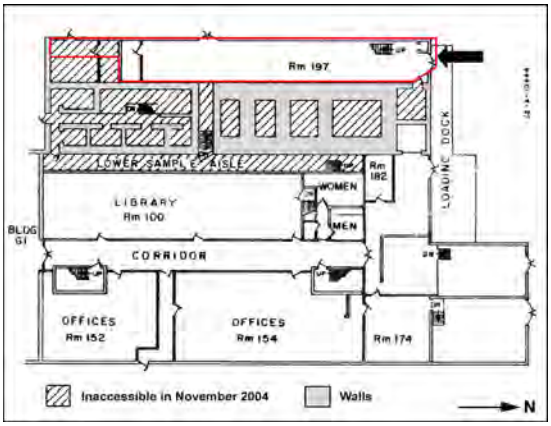


Figure 7-32. G2 337-Foot Level, Lower Filter Room

Lower Filter Aisle Configuration

The Lower Filter Aisle, as originally configured was 120 feet long by 13 feet wide and 15 feet high and explosion-proof.

Lower Filter Aisle Modifications Since Initial Construction

Either the Upper or Lower Filter Aisle was modified and converted to a laundry facility in 1961; the reference is not specific (C-000106, pp. 1-2). Filters and exhaust ductwork were removed at that time. In 1968, the area was converted to office space. This area is currently designated Room 197.

A 1976 document stated "inside the present welding school are a number of metal plates on the floor which are part of the boundary to the SPRU access aisle located at the level below. The plates are ¼ inch diamond plate welded to the steel flooring and provide a complete seal. One of the plates is inside the janitorial cabinet at the NW corner of the welding school. It is located above the emergency escape area of the access aisle and is not welded but sealed in (C-000142)." This document also provides a sketch of the welding school and states that the area has minimum radiological controls.

Lower Filter Aisle Construction Drawings

Lower Filter Aisle original construction and modification drawings are provided in Appendix B, Drawings:

Drawing No. 2828-1-1, Layout Building G2, March 26, 1948
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Drawing No. G2-A-2833, Modifications-Building G2 Filter Aisles, April 10, 1961
Figure G-337, SPRU Building G2-Floor Plans, Elevation 337', ERG June 2004.

Lower Filter Aisle Photographs

Historical photographs are provided in Appendix C, Photographs, MISC-13 and MISC 15. Figures 7-33 and 7-34 are photographs of Room 197 in November 2004.

Figure 7-33. Photo G2-143, G2 337-Foot Level, Room 197 View 2, November 2004

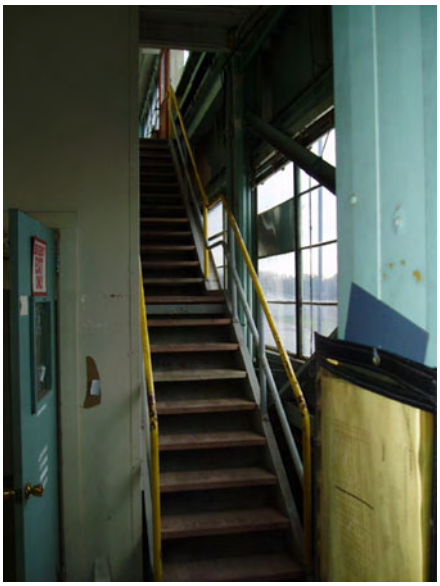


Figure 7-34. Photo G2-145, G2 337-Foot Level, Northwest Stairway, November 2004

Lower Filter Aisle Radiation Survey History

On February 2, 1981, during a radiological control survey of Room 197, loose surface contamination measuring 1,800 picoCuries per 100 square centimeters beta-gamma and 900 picoCuries per probe area

fixed alpha was identified at the base of a vertical I-beam. The area was cleaned, but additional surveys produced up to 2,250 picoCuries per 100 square centimeters beta-gamma and 120 picoCuries per 100 square centimeters alpha on an exhaust louver in the wall of the former Decontaminating Chamber. The louver was removed and no other contamination was detected (R-001126, p. G2-197).

On November 21, 1984, a radiological survey in Room 197 detected loose radioactivity measuring less than 50 picoCuries per probe area alpha and 1,800 picoCuries per probe area beta-gamma. The radioactivity was associated with a particle approximately 1/16 inch in diameter and 1/8 inch long that appeared to be a mouse dropping (R-001126, p. G2-197).

Loose radioactivity again was detected on June 22, 1989, in the southwest corner of Room 197. Radioactivity indicated 400 picoCuries by direct alpha frisker probe. A swipe indicated less than 50 picoCuries per 100 square centimeters; radiochemistry analysis of the swipe indicated 100 picoCuries per 100 square centimeters of americium-241, plutonium-238, and plutonium-239 (R-001126, p. G2-197).

Because a welding school was also housed in this area and thorium may be present in welding rods, thorium may be present.

7.5.3 SOLVENT STORAGE AREA

Solvent Storage Area Functions

The Solvent Storage Area (Figure 7-35) contained storage tanks for clean and spent solvents, possibly associated with the solvent still. It is not known if the storage tanks are still present.

Solvent Storage Area Construction

The Solvent Storage Area, located at the south end of the Lower Filter Area, is intact and inaccessible.

Solvent Storage Area Construction Drawings

Solvent Storage Area construction drawings provided in Appendix B, Drawings include:

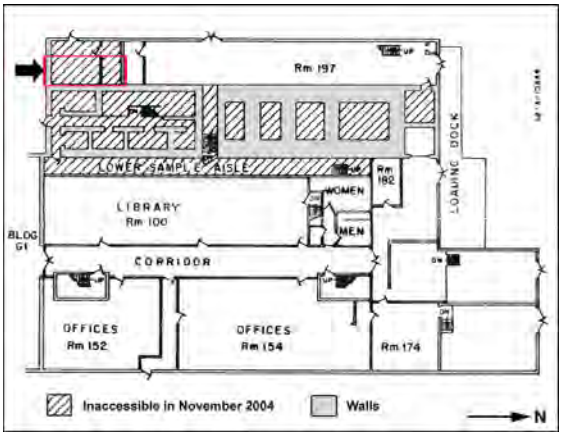


Figure 7-35. Solvent Storage Area

Drawing No. 2828-701-48, Piping Plans and Elevations SS Solvent Above Elevation 337', March 4, 1949
Drawing No. 2828-801-2, First Floor Plan-Elevation 337', July 20, 1948
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Figure G-337, SPRU Building G2-Floor Plans, Elevation 337', ERG, June 2004.

Solvent Storage Area Photographs

No Solvent Storage Area photographs were found.

Solvent Storage Area Radiation Survey History

No Solvent Storage Area radiation survey records were found.

Potential Solvent Storage Area Chemical Hazards

The Solvent Storage Area is inaccessible and it is not known if chemical hazards are present.